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TITLE: REINFORCING TOOL FOR HOLLOW  
STRUCTURE  
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## ABSTRACT:

PROBLEM TO BE SOLVED: To form a light and firm reinforcing member and to efficiently reinforce a hollow structure by the reinforcing member.

SOLUTION: This reinforcing tool for the hollow structure comprises the reinforcing member 11 for reinforcing the hollow structure 1 by being mounted to a hollow room 6 in the hollow structure 1. The reinforcing member 11 comprises multiple lateral wall parts 12 provided at a specified distance in a

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longitudinal direction of the hollow room 6, and also comprises at least one vertical wall part 13 for connecting the multiple lateral wall parts 12. Among the multiple lateral wall parts, a specified lateral wall part 12 and a lateral wall part 12 adjacent thereto on one side are made narrow therebetween on one end side with being connected by a top part 14 and are made wide therebetween on the other end side with being opposed to each other, while the specified lateral wall part 12 and a lateral wall part 12 adjacent thereto on the other side are made wide therebetween on one end side with being opposed to each other and are made narrow therebetween on the other end side with being connected by a bottom part 15.

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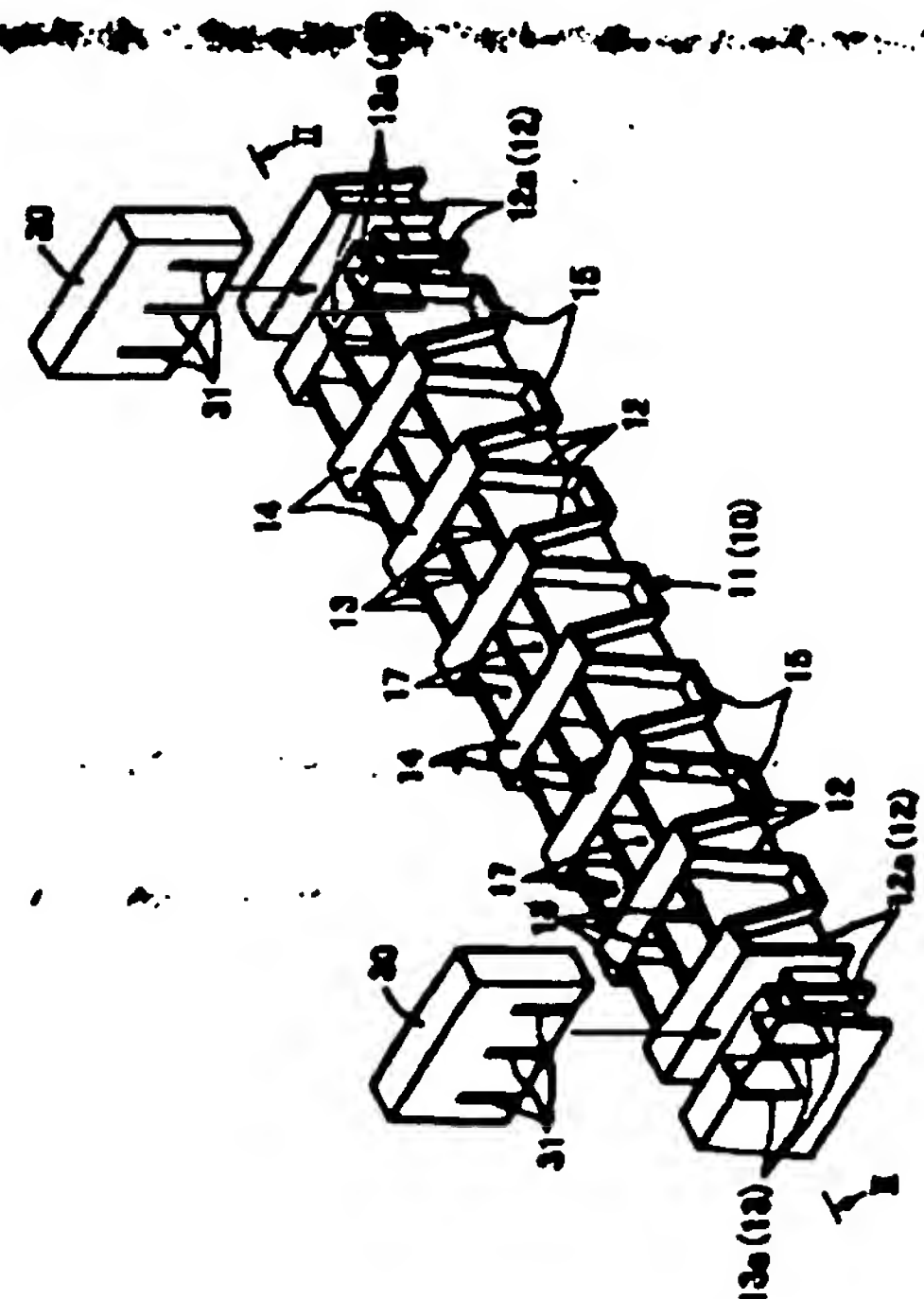
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(54)【発明の名称】 中空構造物の補強具

(57)【要約】

【課題】 軽量でかつ強固な補強部材を構成し、その補強部材によって中空構造物を効率よく補強する。

【解決手段】 中空構造物1の中空室6に装着されて中空構造物1を補強する補強部材11を備えた補強具であって、補強部材11は、中空室6の長手方向に所要とする間隔を隔てて配設された複数の横壁部12と、これら複数の横壁部12を連結する少なくとも1つの縦壁部13とを備える。複数の横壁部12のうち、所定の横壁部12とその片側に隣接する横壁部12とは、一端側が狭くかつ頂部14によって結合されるとともに他端側が広くなって対向し、所定の横壁部12とその反対側に隣接する横壁部12とは、一端側が広くなって対向するとともに他端側が狭くなりかつ底部15によって結合されている。



【特許請求の範囲】

【請求項1】 中空構造物の中空室に装着されて前記中空構造物を補強する補強部材を備えた補強具であって、前記補強部材は、前記中空室の長手方向に所要とする間隔を隔てて配設された複数の横壁部と、これら複数の横壁部を連結する少なくとも1つの縦壁部とを備え、前記複数の横壁部のうち、所定の横壁部とその片側に隣接する横壁部とは、一端側が狭くかつ頂部によって結合されるとともに他端側が広がって対向し、前記所定の横壁部とその反対側に隣接する横壁部とは、一端側が広くなって対向するとともに他端側が狭くなりかつ底部によって結合されている中空構造物の補強具。

【請求項2】 中空構造物の中空室に装着されて前記中空構造物を補強する補強部材を備えた補強具であって、前記補強部材は、前記中空室の長手方向に所要とする間隔を隔てて配設された複数の横壁部と、これら複数の横壁部を連結する複数の縦壁部とを備え、前記複数の横壁部のうち、所定の横壁部とその片側に隣接する横壁部とは、一端側が狭くかつ頂部によって結合されるとともに他端側が広がって対向し、前記所定の横壁部とその反対側に隣接する横壁部とは、一端側が広くなって対向するとともに他端側が狭くなりかつ底部によって結合され、

前記複数の横壁部と前記複数の縦壁部によって囲まれた部分には、一端部が前記頂部によって塞がれ他端部が広くなって開口する空間部と、一端部が広くなって開口し他端部が狭くなりかつ前記底部によって塞がれた空間部とがそれぞれ区画形成されている中空構造物の補強具

【請求項3】 中空構造物の中空室に装着されて前記中空構造物を補強する補強部材を備えた補強具であって、前記補強部材は、前記中空室の長手方向に延びる複数の縦壁部と、これら複数の縦壁部を連結する複数の横壁部とを備え、前記複数の縦壁部のうち、所定の縦壁部とその片側に隣接する縦壁部とは、一端側が狭くかつ頂部によって結合されるとともに他端側が広がって対向し、前記所定の縦壁部とその反対側に隣接する縦壁部とは、一端側が広くなって対向するとともに他端側が狭くなりかつ底部によって結合され、

前記複数の縦壁部と前記複数の横壁部によって囲まれた部分には、一端部が前記頂部によって塞がれ他端部が広くなって開口する空間部と、一端部が広くなって開口し他端部が狭くなりかつ前記底部によって塞がれた空間部とがそれぞれ区画形成されている中空構造物の補強具

【請求項4】 請求項3に記載の中空構造物の補強具であって、

補強部材の複数の縦壁部のうち、両側部に位置する両外側縦壁部の長手方向の両端部は外側端末壁部によって一

体に結合され、

前記両外側縦壁部と前記両外側端末壁部によって現状をなす外側周壁部が構成している中空構造物の補強具。

【請求項5】 請求項4に記載の中空構造物の補強具であって、補強部材の両外側縦壁部の内側に隣接する両内側縦壁部の長手方向の両端部は内側端末壁部によって一体に結合され、

前記両内側縦壁部と前記両内側端末壁部によって、外側周壁部の内周に沿って現状をなす内側周壁部が構成している中空構造物の補強具。

【請求項6】 請求項5に記載の中空構造物の補強具であって、

外側周壁部の一端部をなす外側端末壁部と、内側周壁部の一端部をなす内側端末壁部は、中空室の一端にほぼT字状をなして連通する別の中空室に向けて延びる延長部分をそれぞれ有している中空構造物の補強具。

【請求項7】 請求項5に記載の中空構造物の補強具であって、

外側周壁部の外側縦壁部と、内側周壁部の内側縦壁部との間に跨って外側横壁部が一体に設けられている中空構造物の補強具。

【請求項8】 請求項5に記載の中空構造物の補強具であって、

内側周壁部の両内側縦壁部の間に跨って内側横壁部が一体に設けられている中空構造物の補強具

【請求項9】 請求項1～8のいずれか一項に記載の中空構造物の補強具であって、

補強部材は強化用繊維が混入された合成樹脂材料によって形成されている中空構造物の補強具。

【請求項10】 請求項1～8のいずれか一項に記載の中空構造物の補強具であって、

補強部材には、外部加熱によって発泡体となることで、前記中空構造物の中空室の内周壁面と前記補強部材とを結合する発泡性基材が装着されている中空構造物の補強具。

【請求項11】 請求項10に記載の中空構造物の補強具であって、

発泡性基材は、外部加熱によって発泡体となることで、中空構造物の中空室を遮断する構成にしてある中空構造物の補強具。

【請求項12】 請求項5に記載の中空構造物の補強具であって、

補強部材の外側周壁部の高さ方向の両端部近傍において、外部加熱によって発泡体となることで、前記中空構造物の中空室の内周壁面と前記補強部材とを結合する発泡性基材が装着されている中空構造物の補強具。

【請求項13】 請求項12に記載の中空構造物の補強具であって、

補強部材の外側周壁部の高さ方向の両端部近傍には、発



泡性基材を保持するための凹部が、同外側周壁部に沿ってほぼ環状に設けられている中空構造物の補強具。

【請求項14】 請求項1～13に記載の中空構造物の補強具であって、

補強部材は、その端部に対し別の補強部材を連結手段によって連結可能に構成されている中空構造物の補強具。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、中空構造物の補強具に関し、主として複数枚のパネルによって中空の箱形閉じ断面に構成された中空パネル（例えば、車両ボディのセンタピラー、フロントピラー、クォータピラー、ルーフサイドパネル、ロッカパネル等）を補強するための中空構造物の補強具に関する。

【0002】

【従来の技術】従来、車両ボディの中空パネルの補強構造としては、中空パネルを構成するインナパネルとアウトパネルとの間に金属製リインホースメントパネルを内設して中空パネルを補強しているのが一般的であった。しかしながら金属製リインホースメントパネルによって中空パネルを補強すると、中空パネルの重量が大幅に増加し、燃費等に悪影響を及ぼす。このようなことから、中空パネルの重量増加を抑えて中空パネルを補強するために、図29に示すように、中空パネルの中空室に合成樹脂製の補強部材211を内設して中空パネルを補強することが知られている。すなわち、合成樹脂製の補強部材211は、中空室の長手方向にそれぞれ直交する複数枚の補強プレート212と、これら複数枚の補強プレート212を所定間隔を保って一体に連結する連結片213とを備えている。

【0003】また、補強部材211は、複数枚の補強プレート212のうち、両端部の補強プレート212と、これら補強プレート212にそれぞれ隣接する補強プレート212との間には、発泡性基材230が差し込まれて保持されている。そして、外部加熱によって発泡性基材230が発泡し発泡体となることで、その発泡体の周縁部が中空パネルの内周面に接着するようになっている。このような構造をもつ中空構造物の補強具としては、例えば、特開平10-53156号に開示されている。

【0004】

【発明が解決しようとする課題】ところで、前記従来の中空構造物の補強具において、中空室の長手方向にそれぞれ直交する複数枚の補強プレート212と、これら複数枚の補強プレート212を所定間隔を保って連結する連結片213とによって構成される補強部材211は、その連結片213において撓み変形しやすい構造となる。このため、連結片213が撓む方向に対しては中空構造物の補強が弱くなるという問題点があった。また、補強プレート212の間隔寸法を小さくし、その分だけ連結片213を短くすると、連結片213が撓みにくく

なる。しかしながら、補強プレート212の間隔寸法を小さくしてその補強プレート212の枚数を増加すると、多量の合成樹脂材料が必要となり、コスト高となる。さらに、補強プレート212の間隔寸法を小さくすると、成形型から補強部材を脱型することが困難となる場合がある。

【0005】この発明の目的は、前記従来の問題点に鑑み、軽量でかつ強固な補強部材を構成することができ、その補強部材によって中空構造物を効率よく補強することができる中空構造物の補強具を提供することである。

【0006】

【課題を解決するための手段】前記目的を達成するために、第1の発明に係る中空構造物の補強具は、請求項1に記載のとおり構成を要旨とするものである。したがって、第1の発明によれば、補強部材の複数の横壁部が、頂部と底部によってそれぞれ結合されて長手方向に一体状をなし、これら複数の横壁部が縦壁部によって連結されて補強部材が構成されている。このように構成された補強部材は、同補強部材を形成するための材料、例えば、合成樹脂材料を、隣接する横壁部の間の空間部によって形成することができるとともに、軽量なものとなる。また、例えば、射出成形によって補強部材を形成する場合には、その成形型から補強部材を容易に脱型することができる。また、複数の横壁部の撓み変形は縦壁部、頂部及び底部によって防止され、縦壁部の撓み変形は複数の横壁部、頂部及び底部によって防止される。このため、補強部材は、多方向からの荷重に対し変形し難い構造となる。

【0007】また、第2の発明に係る中空構造物の補強具は、請求項2に記載のとおり構成を要旨とするものである。

【0008】また、第3の発明に係る中空構造物の補強具は、請求項3に記載のとおり構成を要旨とするものである。したがって、第2及び第3の発明によれば、補強部材の複数の横壁部と複数の縦壁部によって囲まれた部分には、一端部が頂部によって塞がれ他端部が広がって開口する空間部と、一端部が広がって開口し他端部が底部によって塞がれた空間部とがそれぞれ区画形成されることで補強部材が構成されている。このように構成された補強部材は、同補強部材を形成するための材料、例えば、合成樹脂材料を、区画形成された空間部によって形成することができるとともに、軽量なものとなる。また、例えば、射出成形によって補強部材を形成する場合には、その成形型から補強部材を容易に脱型することができる。また、複数の横壁部の撓み変形は複数の縦壁部、頂部及び底部によって防止され、複数の縦壁部の撓み変形は複数の横壁部、頂部及び底部によって防止される。このため、補強部材は、多方向からの荷重に対し変形し難い構造となる。

【0008】また、第4の発明に係る中空構造物の補強具は、請求項4に記載のとおり構成を要旨とするものである。

であり、補強部材の複数の縦壁部のうち、両側部に位置する両外側縦壁部の長手方向の両端部は外側端末壁部によって一体に結合され、前記両外側縦壁部と前記両外側端末壁部によって環状をなす外側周壁部が構成されている。このように、補強部材の両外側縦壁部が外側端末壁部によって一体に結合されて環状をなす外側周壁部が構成されることによって、補強部材が変形し難い構造となり、補強強度が高められる。

【0009】また、第5の発明に係る中空構造物の補強具は、請求項5に記載のとおり構成を要旨とするものであり、補強部材の両外側縦壁部の内側に隣接する両内側縦壁部の長手方向の両端部は内側端末壁部によって一体に結合され、前記両内側縦壁部と前記両内側端末壁部によって、外側周壁部の内周に沿って環状をなす内側周壁部が構成されている。このように、補強部材の両外側縦壁部が外側端末壁部によって一体に結合されて環状をなす外側周壁部が構成され、同補強部材の両内側縦壁部が内側端末壁部によって一体に結合されて内側周壁部が構成されることによって、補強部材がより一層変形し難い構造となり、補強強度がより一層良好に高められる。

【0010】また、第6の発明に係る中空構造物の補強具は、請求項6に記載のとおり構成を要旨とするものであり、補強部材の外側周壁部の一端部をなす外側端末壁部と、内側周壁部の一端部をなす内側端末壁部は、中空室の一端にほぼT字状をなして連通する別の中空室に向けて延びる延長部分をそれぞれ有している。したがって、補強部材の外側周壁部の一端部をなす外側端末壁部と、内側周壁部の一端部をなす内側端末壁部とのそれぞれの延長部分が、中空室の一端にほぼT字状をなして連通する別の中空室に向けて延びることによって、当該部

分においても補強することができ、例えば、セクタビラーと、ルーフサイドパネル（ルーフサイドレールとも言う）とのT字状の交差部等においても良好に補強することができる。

【0011】また、第7の発明に係る中空構造物の補強具は、請求項7に記載のとおり構成を要旨とするものであり、外側周壁部の外側縦壁部と、内側周壁部の内側縦壁部との間に跨って外側横壁部が一体に設けられている。また、第8の発明に係る中空構造物の補強具は、請求項8に記載のとおり構成を要旨とするものであり、内側周壁部の両内側縦壁部の間に跨って内側横壁部が一体に設けられている。

【0012】また、第9の発明に係る中空構造物の補強具は、請求項9に記載のとおり構成を要旨とするものであり、強化用繊維が混入された合成樹脂材料によって補強部材が形成されることで、補強部材がより一層変形し難い強固な構造となる。

【0013】また、第10の発明に係る中空構造物の補強具は、請求項10に記載のとおり構成を要旨とするものであり、外部加熱によって発泡性基材が発泡し発泡

体となり、その発泡体によって中空室の内周壁面と補強部材とが一体状に結合されるため、中空室の内周壁面と補強部材との間の隙間において補強部材を振動させることなく強固に固着することができ、中空構造物の補強に効果が大きい。

【0014】また、第11の発明に係る中空構造物の補強具は、請求項11に記載のとおり構成を要旨とするものであり、外部加熱によって発泡性基材が発泡し発泡体となり、その発泡体によって中空室を遮断することができ、中空構造物の制振性や遮音性の向上を図ることができる。

【0015】また、第12の発明に係る中空構造物の補強具は、請求項12に記載のとおり構成を要旨とするものであり、補強部材の外側周壁部の高さ方向の両端部近傍において、外部加熱によって発泡体となることで、前記中空構造物の中空室の内周壁面と前記補強部材とを結合する発泡性基材が装着されている。したがって、外側周壁部の高さ方向の両端部近傍の発泡性基材がそれぞれ発泡し、発泡体となって補強部材の外側周壁部の高さ方向の両端部の周囲と、中空構造物の内周壁面とを結合することができる。このため、中空構造物に作用する荷重を、各発泡体を介して補強部材において受け止めることができ、中空構造物の補強に効果が大きい。

【0016】また、第13の発明に係る中空構造物の補強具は、請求項13に記載のとおり構成を要旨とするものであり、補強部材の外側周壁部の高さ方向の両端部近傍には、発泡性基材を保持するための凹部が、同外側周壁部に沿ってほぼ環状に設けられている。したがって、各発泡性基材が発泡する際、各凹部の内側面によって各発泡性基材の発泡方向を規制しこれら各発泡性基材が中空構造物の内周壁面に向けて発泡させることが可能となる。このため、各発泡性基材の発泡による発泡体が中空構造物の内周壁面に隙間なく接着し、これによって、中空構造物の内周壁面と補強部材とを確実に結合することができる。

【0017】また、第14の発明に係る中空構造物の補強具は、請求項14に記載のとおり構成を要旨とするものであり、補強部材の端部に連結手段によって別の補強部材が連結されることで、中空構造物を所望とする長さにならって容易に補強することができる。また、単体の補強部材を短尺に形成することが可能となり、補強部材を短尺化した分だけ製作、保管、運搬、取り扱い等が容易となる。

【0018】

【発明の実施の形態】（実施の形態1）この発明の実施の形態1を図1～図5にしたがって説明する。図2と図3において、中空パネル（例えば、セクタビラー）1は、インナパネル2とアウトパネル4とがその相互のフランジ3、5によってスポット溶接されることで、中空の箱形閉じ断面に構成されている。インナパネル2に



は、その上下部の所定位置に取付孔7が形成されている。前記中空パネル1は、その中空室6内に補強具10が装着されて補強されている。

【0019】図1と図2に示すように、前記補強具10は、中空パネル1の中空室6の長手方向に所要とする長さ寸法を有しかつ取付手段によって中空室6内に装着されて中空パネル1を補強する補強部材11と、その補強部材11の所定位置に配設された発泡性基材30とを備えている。前記補強部材11は、中空パネル1の中空室6の内周壁面との間に所定の隙間をもち、かつ中空室6の長手方向に所要とする間隔を隔てて配設された複数の横壁部12と、これら複数の横壁部12を連結する複数の縦壁部13とを一体に備えている。また、前記補強部材11は、耐熱性を有する硬質合成樹脂、望ましくは、強化用繊維が混入された硬質合成樹脂材料よりなり、射出成形によって一体成形されている。硬質合成樹脂材料としては、例えば、PA（ポリアミド）、PBT（ポリブチレンテレフタレート）、PET（ポリエチレンテレフタレート）、PP（ポリプロピレン）、PPS（ポリフェニレンサルファイド）等が用いられる。また、強化用繊維としては、例えば、ガラス繊維、カーボン繊維、ケブラー繊維等が用いられる。さらに、硬質合成樹脂材料に対する強化繊維の混入割合は、5～65重量%、望ましくは30～40重量%の混入割合に設定される。

【0020】前記補強部材11の複数の横壁部12のうち、所定の横壁部12とその片側に隣接する横壁部12とは、一端側（図2に向かって上側）が狭くかつ頂部14によって結合されるとともに、他端側（図2に向かって下側）が広くなって略ハの字状に対向している。また、前記所定の横壁部12とその反対側に隣接する横壁部12とは、一端側（図2に向かって上側）が狭くかつ頂部14によって結合されるとともに、他端側（図2に向かって下側）が狭くかつ底部15によって結合されている。そして、前記複数の横壁部12と複数の縦壁部13によって囲まれた部分には、一端側（図2に向かって上側）が狭くかつ頂部14によって塞がれ他端側（図2に向かって下側）が広くなって開口する空間部16と、一端側（図2に向かって上側）が広くなって開口し他端側（図2に向かって下側）が狭くかつ底部15によって塞がれた空間部17とが中空室6の長手方向に交互に隣接して区画形成されている。また、前記隣接する横壁部12の対向角度は5度～60度の範囲、望ましくは10度～30度の範囲において設定されている。隣接する横壁部12の対向角度が5度以下となると補強部材11を射出成型用の成形型から脱型することが困難となる場合がある。また、隣接する横壁部12の対向角度が60度以上に大きくなると、所要とする長さ内に対する横壁部12の配設数が少なくなり強固な補強部材11を成形することができない場合がある。但し、後に詳述する発泡性基材30が配設される部分の横壁部12aは略平行状を

なしている。

【0021】また、この実施の形態1において、図2に示すように、補強部材11の両端部寄りに位置する底部15の下面には、インナパネル2の取付孔7に差し込まれて弾性的に係合する取付手段としての取付クリップ50が一体状に形成されている。この取付クリップ50は、底部15に設けられた座部51、その座部51から突出されて取付孔7に差し込まれる脚部52とその脚部52の先端から折返し状に延出され取付孔7に弾性的に係合する一対の係止片53とを備えている。

【0022】また、この実施の形態1において、前記補強部材11の複数の横壁部12のうち、補強部材11の両端部寄りに位置してそれぞれ隣接する横壁部12aは略平行状をなして対向している。さらに、これら隣接する横壁部12aの間には頂部14あるいは底部15が設けられることがなく、しかも、縦壁部13aの高さ寸法も低くなっている。そして当該横壁部12aの間には、外部加熱によって発泡し発泡体35となって中空パネル1の内周壁面と補強部材11とを一体状に結合しかつ中空室6を遮断するための発泡性基材30がそれぞれ設けられている。

【0023】前記発泡性基材30は、外部加熱によって発泡する発泡剤混入の合成樹脂系の発泡性材料よりなり、かつ射出成形等によって所要とする形状に形成されている。そして、発泡性基材30の所定位置には縦壁部13aに差し込まれる溝状の切込部31が形成されている。また、発泡性基材30は、金属面や合成樹脂面に対し接着性を有する合成樹脂を主成分とし、これに、発泡剤、ガラス繊維のような強化用の繊維状物質等が混合され、車両ボディの焼き付け塗装の際の熱（例えば、110℃～190℃程度の温度）によって発泡し高剛性の発泡体となる発泡性材料より形成されることが望ましい。このような接着性を有しかつ高剛性の発泡体となる発泡性材料としては、例えば、特開平8-208871号公報、特開平11-158313号公報等に記載されている。

【0024】前記したように補強部材11と発泡性基材30とを備えた補強具10は、次に述べるようにして中空パネル1の中空室6内に装着されて中空パネル1を補強するとともに中空室6を遮断するものである。すなわち、図2と図3に示すように、中空パネル1の中空室6に対し、補強具10を装着する場合、まず、中空パネル1を構成するインナパネル2とアウトパネル4とを、その相互のフランジ3、5においてスポット溶接する前に、インナパネル2の取付孔7に対し補強具10がその補強部材11の取付クリップ50において装着される。その後、インナパネル2とアウトパネル4とが、その相互のフランジ3、5においてスポット溶接され、中空の箱形閉じ断面をなす中空パネル1が構成される。

【0025】ここで、外部からの加熱、例えば、前記中

中空パネル1を有する車両ボディの焼付塗装の際の外加熱によって、補強部材11の両端部寄りの発泡性基材30がそれぞれ発泡し発泡体35となる(図5参照)。発泡性基材30が発泡する際、その発泡性基材30の両側面は隣接する横壁部12aによってそれぞれ支持される。このため、中空室6の長手方向に対する発泡性基材30の発泡が制限され長手方向に直交する方向に対しは発泡が促進される。そして、発泡性基材30の発泡による発泡体35が中空室6の内周壁面に隙間なくそれぞれに接着する。これによって、中空パネル1と内周壁面と補強部材11とが一体状に結合され、中空パネル1が補強されるとともに中空室6が遮断される。

【0026】前記補強具10の本体部分をなす合成樹脂製の補強部材11において、その複数の横壁部12と複数の縦壁部13によって囲まれた部分には、一端部が頂部14によって塞がれ他端部が広くなって開口する空間部16と、一端部が広くなって開口し他端部が底部15によって塞がれた空間部17とが中空室6の長手方向に交互に隣接して区画形成されることで構成されている。このように構成された補強部材11は、同補強部材11を成形するための合成樹脂材料を、中空室6の長手方向に交互に隣接して区画形成された空間部16、17によって閉鎖することができるとともに、軽量なものとなる。

【0027】また、射出成形によって補強部材11を成形する場合には、各空間部16、17はその開口部が広いテーパ状をなすため、射出成型用の成形型から補強部材11を容易に脱型することができる。また、複数の横壁部12の組み変形は、複数の縦壁部13、頂部14及び底部15によって防止される。さらに、複数の縦壁部13の組み変形は、複数の横壁部12、頂部14及び底部15によって防止される。このため、補強部材11は、多方向からの荷重に対し変形し難い構造となり、中空パネル1の補強に効果大きい。

【0028】また、この実施の形態1において、補強部材11は強化用繊維が混入された合成樹脂材料によって形成されることで、補強部材11がより一層強固に補強することが可能となる。また、補強部材11の両端部寄り位置して隣接する横壁部12aの間にそれぞれ設けられた発泡性基材30が外部加熱によって発泡し発泡体35となり、中空室6の内周壁面に隙間なく接着する。このため、中空パネル1と内周壁面と補強部材11とを一体状に結合して、補強効果を高めることができるばかりでなく、発泡体35によって中空室6を遮断して中空パネル1の制振性や遮音性の向上を図ることができる。

【0029】なお、前記実施の形態1においては、複数の横壁部12が中空パネル1の中空室6の長手方向に対し略直交する方向に配設される場合を例示したが、図6

に示すように、中空パネル1の中空室6の長手方向に対し適宜に傾いて複数の横壁部12を配列しても略同等の作用効果が得られる。また、前記実施の形態1においては、複数の横壁部12が複数の縦壁部13によって中空パネル1の中空室6の長手方向に連結される場合を例示したが、図7に示すように、複数の横壁部12が1つの縦壁部13によって中空パネル1の中空室6の長手方向に連結されて補強部材11が構成されてもよい。

【0030】図7に示すように補強部材11を構成した場合、その補強部材11を成形するための合成樹脂材料を、隣接する横壁部12の間の空間部によって閉鎖することができるとともに、軽量なものとなる。また、例えば、射出成形によって補強部材11を成形する場合には、その成形型から補強部材11を容易に脱型することができる。また、複数の横壁部12の組み変形は1つの縦壁部13、頂部14及び底部15によって防止され、1つの縦壁部13の組み変形は複数の横壁部12、頂部14及び底部15によって防止される。このため、補強部材11は、多方向からの荷重に対し変形し難い構造となる。

【0031】(実施の形態2)次に、この発明の実施の形態2を図8～図12にしたがって説明する。この実施の形態2において、補強部材11は、実施の形態1と略同様にして耐熱性を有する硬質合成樹脂、望ましくは、強化用繊維が混入された硬質合成樹脂材料よりなり、射出成形によって一体成形されている。この補強部材11は、中空パネル1の中空室6の長手方向に延びる複数の縦壁部13と、これら複数の縦壁部13を連結する複数の横壁部12とを一体に備えている。

【0032】前記補強部材11の複数の縦壁部13のうち、中央部に位置する縦壁部13とその片側に隣接する縦壁部13とは、一端側(図10に向かって上側)が狭くかつ頂部14によって結合されるとともに、他端側(図10に向かって下側)が広くなって略ハの字状に対向している。また、前記中央部に位置する縦壁部13とその反対側に隣接する縦壁部13とは、一端側(図10に向かって上側)が広くなって略逆ハの字状に対向するとともに、他端側(図10に向かって下側)が狭くかつ底部15によって結合されている。そして、前記複数の横壁部12と複数の縦壁部13によって囲まれた部分には、一端側(図10に向かって上側)が狭くかつ頂部14によって塞がれ他端側(図10に向かって下側)が広くなって開口する空間部16と、一端側(図10に向かって上側)が広くなって開口し他端側(図10に向かって下側)が狭くかつ底部15によって塞がれた空間部17とが中空室6の短手方向に交互に隣接して区画形成されている。なお、隣接する縦壁部13の対向角度は5度～60度の範囲、好ましくは10度～30度の範囲において設定されている。

【0033】また、この実施の形態2において、図9に



示すように、補強部材11の両端部寄りに位置する底部15の下面には、実施の形態1と略同様に構造をもつ取付クリップ50が一体状に形成されている。また、この実施の形態2において、前記補強部材11の複数の横壁部12のうち、図9と図11に示すように、補強部材11の両端部寄りに位置してそれぞれ隣接する横壁部12aの間には、頂部14、底部15及び中央部の縦壁部13が設けられることがなく、しかも、両側部の縦壁部13aの高さ寸法も低くなっている。そして当該横壁部12aの間には、外部加熱によって発泡し発泡体35とな

って中空パネル1の内周壁面と補強部材11とを一体状に結合しかつ中空室6を遮断するための発泡性基材30がそれぞれ設けられている。この実施の形態2のその他の構成は実施の形態1と略同様にして構成されるため、同一構成部分に対し同一符号を付記してその説明は省略する。

【0034】したがって、この実施の形態2においても、前記実施の形態1と略同様の作用効果を奏する。すなわち、補強部材11を成形するための合成樹脂材料を、空間部16、17によって剛化するできるとともに、軽量なものとなり、しかも各空間部16、17はその開口部が広いテーパ状をなすため、成形型から補強部材11を容易に脱型することができる。また、複数の横壁部12の横み変形は、複数の縦壁部13、頂部14及び底部15によって防止される。さらに、複数の縦壁部13の横み変形は、複数の横壁部12、頂部14及び底部15によって防止される。このため、補強部材11は、多方向からの荷重に対し変形し難い構造となり、中空パネル1の補強に効果大きい。また、補強部材11の両端部寄り位置して隣接する横壁部12aの間にそれぞれ設けられた発泡性基材30が外部加熱による発泡体35によって、補強効果を高めることができるとともに、中空室6を遮断して中空パネル1の制振性や遮音性の向上を図ることができる。なお、前記実施の形態2においては、複数の横壁部12が中空室6の長手方向に対し略直交する方向に配設される場合を例示したが、中空パネル1の中空室6の長手方向に対し適宜に傾いて複数の横壁部12を配列しても略同等の作用効果が得られる。

【0035】（実施の形態3）この発明の実施の形態3を図13～図16にしたがって説明する。この実施の形態3においては、前記実施の形態1（又は実施の形態2）と略同様な構造をもつ補強部材11の端部に連結手段によって別の補強部材11を中空パネルの中空室の長手方向に連結可能に構成したものである。図13に示すように、連結手段は、補強部材11の一端部に位置する横壁部12の外側面に形成された所要数の弾性係止片60と、その補強部材11の一端部の横壁部12に対向する別の補強部材11の端部に位置する横壁部12に形成されかつ所要数の弾性係止片60に対応する連結孔61

とを備えている。そして、補強部材11の所要数の弾性係止片60が、発泡性基材30に貫設された挿通孔を通して別の補強部材11の連結孔61に差し込まれることで弾性的に係合し、これによって補強部材11の端部に発泡性基材30を間に挟んで別の補強部材11が連結されるようになっている。

【0036】したがって、この実施の形態3においては、同一構造の所要数の補強部材11を連結したり、あるいは、異なる構造、例えば、実施の形態1の補強部材11と実施の形態2の補強部材11とを連結して所望とする長さを有する補強部材を容易に構成することが可能となる。また、短尺で単体の補強部材11を連結して所望とする長さの補強部材を構成することも可能となり、補強部材11を短尺化した分だけ製作、保管、運搬、取り扱い等が容易となる。

【0037】前記実施の形態3において、補強部材11の端部に別の補強部材11を連結するための連結手段としては、図14～図16に示す構造ものを採用することができる。すなわち、図14に示す連結手段において、補強部材11の両端部の横壁部12の外面には連結部62、63がそれぞれ突設されている。これら両連結部62、63のうち、一方の連結部62には係合片64が突設され、他方の連結部63には連結孔65が形成されている。そして、補強部材11の端部に別の補強部材11を連結する場合には、補強部材11の連結部62の係合片64が別の補強部材11の連結部63の連結孔65に差し込まれて係合されることで、補強部材11の端部に別の補強部材11が連結されるようになっている。

【0038】また、図15に示す連結手段において、補強部材11の両端部の横壁部12の外面には連結部66、67がそれぞれ突設されている。これら両連結部66、67には連結孔がそれぞれ形成されている。そして、補強部材11の連結部66と、別の補強部材11の連結部67とが上下に重ね合わされ、これら両連結部66、67の連結孔にわたってボルト68が挿通されナット69によって締め付けられることで、補強部材11の端部に別の補強部材11が連結されるようになっている。なお、ボルト68、ナット69に換えて連結クリップを両連結部66、67の連結孔にわたって差し込んで補強部材11の端部に別の補強部材11を連結することもできる。

【0039】また、図16に示す連結手段において、補強部材11の両端部の横壁部12の外面には連結部70、71がそれぞれ突設されている。そして、補強部材11の連結部70と、別の補強部材11の連結部71とが上下に重ね合わされ、これら両連結部70、71が接着剤、粘着剤等によって接着72されることで、補強部材11の端部に別の補強部材11が連結されるようになっている。

【0040】前記実施の形態1～3においては、発泡性

基材30の加熱発泡による発泡体35によって、中空室6を遮断して、中空パネル1の制振性や遮音性の向上を図るように構成したが、中空室6は必ずしも遮断しなくてもよい。例えば、補強部材11の頂部14や底部15に対し発泡性基材30を配設し、その発泡性基材30の加熱発泡による発泡体35によって中空パネル1の中空室6の内周壁面と補強部材11とを一体状に結合することによって、中空室6内に対し、補強部材11を振動させることなく強固に固着することができ、中空パネル1の補強に効果が大きい。

【0041】(実施の形態4)この発明の実施の形態4を図17～図28にしたがって説明する。この実施の形態4において、補強部材111は、実施の形態1あるいは実施の形態2と略同様に耐熱性を有する硬質合成樹脂、望ましくは、強化用繊維が混入された硬質合成樹脂材料よりなり、射出成形によって一体成形されている。この補強部材111は、中空パネル1の中空室6の長手方向に延びる複数の縦壁部113と、これら複数の縦壁部113を連結する複数の横壁部112とを一体に備えている。

【0042】図17～図19に示すように、前記補強部材111の複数の縦壁部113のうち、所定、例えば、図18に向かって、左から2番目の内側縦壁部113bと、その外側に隣接する外側縦壁部113aとは、上側が広くなって略逆ハの字状に対向するとともに、下側が狭くかつ底部115によって結合されている。図18に向かって、左から2番目の内側縦壁部113bと、その内側に隣接する図18に向かって右から2番目の内側縦壁部113bとは、上側が狭くかつ頂部114によって結合されるとともに、下側が広くなって略ハの字状に対向している。さらに、図18に向かって、右から2番目の外側縦壁部113bと、その外側に隣接する外側縦壁部113aとは、上側が広くなって略逆ハの字状に対向するとともに、下側が狭くかつ底部115によって結合されている。そして、前記複数の横壁部112と複数の縦壁部113によって囲まれた部分には、図18に向かって、上側が広くなって開口し下側が狭くかつ底部115によって塞がれた空間部117と、上側が狭くかつ頂部114によって塞がれ下側が広くなって開口する空間部116とが、中空室6の短手方向に交互に隣接して区画形成されている。すなわち、この実施の形態4の補強部材111は、少なくとも4つの縦壁部113を有して横断面は略W字状をなしている。なお、隣接する縦壁部113の対向角度は5度～60度の範囲、好ましくは10度～30度の範囲において設定されている。

【0043】特に、この実施の形態4において、図17～図19に示すように、補強部材111の複数の(4つ)の縦壁部113のうち、両側に位置する両外側縦壁部113aの長手方向の両端部は、外側端部120によって一体連続状に結合されている。そして、これら両外

側縦壁部113aと、両外側端部120によって環状をなす外側周壁部122が構成されている。また、補強部材111の両外側縦壁部113aの内側に隣接する両内側縦壁部113bの長手方向の両端部は、内側端部121によって一体連続状に結合されている。そして、これら両内側縦壁部113bと、両内側端部121によって環状をなす内側周壁部123が構成されている。

【0044】また、図20と図21に示すように、外側端部120と内側端部121は図18に向かって、上側が広くなって略逆ハの字状に対向するとともに、下側が狭くかつ底部115aによって結合されている。そして、当該底部115aは、前記両側の底部115とほぼ同一面をなして連続するとともに、当該部分の空間部117aは、前記両側の空間部117とほぼ環状をなして連通している。すなわち、外側周壁部122と内側周壁部123との間には、空間部117、117aによってほぼ環状をなす空間部が構成されている。また、図18に示すように、外側周壁部122を構成する外側縦壁部113aと、内側周壁部123を構成する外側横壁部112aとの間に跨って複数の外側横壁部112aが一体に設けられている。さらに、図19に示すように、内側周壁部123を構成する両内側縦壁部113bの間に跨って複数の内側横壁部112bが一体に設けられている。そして、この実施の形態4においては、前記外側横壁部112aあるいは内側横壁部112bが横壁部112を構成している。また、横壁部112(外側横壁部112a及び内側横壁部112b)の肉厚寸法は、縦壁部113(外側縦壁部113a及び内側縦壁部113b)の肉厚寸法よりも適宜に小さく設定されており、材料(合成樹脂材料)の節減が図られている。

【0045】また、この実施の形態4において、図19と図23に示すように、補強部材111の両端部寄りに位置する底部115aの下面には、インナパネル2の取付孔7に差し込まれて弾性的に係合する取付手段としての取付クリップ150が一体成形されている。この取付クリップ150は、実施の形態1とほぼ同様に構成され、座部151、脚部152、及び一对の係止片153を一体に備えている。また、補強部材111には、外部加熱によって発泡し発泡体となることで、中空パネル1の内周壁面と補強部材111とを結合する発泡性基材130～135が装着されている。

【0046】この実施の形態4において、補強部材111に対し発泡性基材130、131を装着するために、図18と図19に示すように、補強部材111の外側周壁部122(外側縦壁部113a及び外側端部120)の高さ方向両端部(上下両端部)近傍において、凹部124、125がそれぞれ設けられている。前記両凹部124、125のうち、外側周壁部122の上端部の凹部124は、外側周壁部122の上端部外周にほぼ環



状をなして張り出されたフランジ部の上面に凹設されかつフランジ部に沿ってほぼ環状をなしている。また、図18と図19に示すように、外側周壁部122の下端部の凹部125は、底部115、115aの下面に凹設されかつ底部115、115aに沿ってほぼ環状をなしている。但し、取付クリップ150の座部151に対する部分において、凹部125は途切れている。さらに、内側周壁部123の頂部114の上面に対しても、その頂部114の長手方向に沿って発泡性基材132を保持するための凹部126が凹設されている。

【0047】また、補強部材111には、中空パネル1の内周壁面と補強部材111とを結合するとともに、前記各発泡性基材130と協働して中空室6を遮断するための所要数の発泡性基材133、134、135が装着されている。この実施の形態4において、前記発泡性基材133、134を装着するために、補強部材111の長手方向の両端部寄りにおいて、それぞれ一対をなす外側横壁部112a、及び内側横壁部112bが狭い間隔を隔てて配設されるとともに、外側縦壁部113aの外側面には、前記外側横壁部112a、及び内側横壁部112bとはほぼ同一面をなして突出する一対の保持片160が設けられている。そして、これら各一対の外側横壁部112a、内側横壁部112b及び保持片160の間には、発泡性基材136がそれぞれ差し込まれて装着されている。

【0048】前記発泡性基材130、136は、実施の形態1の発泡性基材30と同様にして、金属面や合成樹脂面に対し接着性を有する合成樹脂を主成分とし、これに、発泡剤、ガラス繊維のような強化用の繊維状物質等が混合され、車両ボディの焼き付け塗装の際の熱（例えば、110℃～190℃前後の温度）によって発泡し高剛性の発泡体となる発泡性材料より形成されることが望ましい。このような接着性を有しかつ高剛性の発泡体となる発泡性材料としては、例えば、特開平8-208871号公報、特開平11-158313号公報等に開示されている。

【0049】また、補強部材111の外側周壁部122の高さ方向両端部近傍のほぼ環状をなす凹部124、125と、内側周壁部123の頂部114の凹部126にそれぞれ装着される発泡性基材130は、押出成形によって長尺棒状に形成されたものが所定の長さに切断されることによって容易に形成される。そして、各凹部124、125、126に対して、所要とする長さの単数または複数の発泡性基材130が押し込まれ、必要に応じて接着剤によって接着されることによって装着されている。また、ほぼ環状をなしている凹部124、125のコナ部に対しては発泡性基材130が折り曲げられて装着される。

【0050】また、補強部材111の長手方向の両端部寄りの各一対の外側横壁部112a、内側横壁部112

b及び保持片160の間に装着される発泡性基材133、134、135は、射出成形によって所要とする形状の平板状に形成されて、各一対の外側横壁部112a、内側横壁部112b及び保持片160の間に差し込まれて装着される。そして、各一対の外側横壁部112a、内側横壁部112b及び保持片160の間において、各発泡性基材133、134、135が脱落することがないように、各一対の外側横壁部112a、内側横壁部112b及び保持片160の間に接着剤を用いて発泡性基材133、134、135が接着される。また、接着剤に換え、各一対の外側横壁部112a、内側横壁部112b及び保持片160の間に係止突起等の係止部を設けて各発泡性基材133、134、135を係止してもよい。

【0051】前記したように補強部材111と発泡性基材130、136とを備えた補強具110は、実施の形態1とはほぼ同様の工程を経て中空パネル1の中空室6内に装着される（図20～図23参照）。そして、図24に示すように、外部加熱によって各発泡性基材130～135がそれぞれ発泡して発泡体138となることで、補強部材111と中空パネル1の内周壁面とを結合する。これによって、中空パネル1を補強するとともに中空室6を遮断する。また、この実施の形態4においても、前記実施の形態1と略同様にいて、補強部材111を成形するための合成樹脂材料を、空間部116、117によって形成することができるとともに、軽量なものとなり、しかも各空間部116、117はその開口部が広いテーパ状をなすため、成型型から補強部材111を容易に脱型することができる。

【0052】特に、この実施の形態4において、補強部材111の両外側縦壁部113aの長手方向の両端部が外側端部120によって一体連続状に結合されて環状をなす外側周壁部122が構成されている。このため、環状をなす外側周壁部122によって補強部材111が変形し難い構造となり、補強強度が高められる。さらに、補強部材111の両外側縦壁部113aの内側に隣接する両内側縦壁部113bの長手方向の両端部が内側端部121によって一体連続状に結合されて環状をなす内側周壁部123が構成される。しかも、外側周壁部122と内側周壁部123との一端が底部115、115aによって一体に結合され、内側周壁部123の他端が頂部114によって一体に結合されている。このため、補強部材111がより一層変形し難い構造となり、補強強度がより一層良好に高められる。

【0053】さらに、外側周壁部122の高さ方向の両端部近傍において、その外側周壁部122に周囲に沿ってほぼ環状をなす凹部124、125の発泡性基材130、131がそれぞれ発泡し、発泡体138となって補強部材111の外側周壁部122の高さ方向の両端部の

周囲と、中空パネル1の内周壁面とを結合することができる。さらに、内側周壁部123の頂部114の凹部125の発泡性基材130が発泡し、発泡体138となって補強部材111の頂部114と、中空パネル1の内周壁面とを結合することができる。このため、中空パネル1に作用する荷重を、各発泡体138を介して補強部材111において受け止めることができ、中空パネル1の補強に効果大きい。また、補強部材111の長手方向の両端部寄りにおいて、各一对の外側横壁部112a、内側横壁部112b及び保持片160の間にそれぞれ装着された発泡性基材133、134、135がそれぞれ発泡し、発泡体138となって補強部材111と中空パネル1の内周壁面とを結合して中空室6を遮断することができる。このため、補強効果をより一層高めることができる。このため、中空室6を遮断することができ、中空パネル1の耐震性や遮音性の向上を図ることができる。

【0054】前記実施の形態4において、各発泡性基材130～135がそれぞれ発泡する際、各凹部124、125、126の相対する面や、一对の外側横壁部112a、内側横壁部112b及び保持片160の相対する面によって各発泡性基材130～135が中空室6の長手方向に発泡することが規制され、中空パネル1の内周壁面に向けて発泡する。このため、各発泡性基材130～135の発泡による発泡体138が中空パネル1の内周壁面に隙間なく接着する。この結果、隙間の発生による不具合（例えば、遮音不良）を防止することができ

【0055】なお、前記実施の形態4において、例えば、図25と図26に示すように変更してもよい。すなわち、図25に示すように、補強部材111の外側周壁部122の外側面に押し、接着剤によって、複数の発泡性基材136、137が貼り付けられている。そして、これら発泡性基材136、137の発泡による発泡体136a、137aによって中空パネル1の中空室6の内周壁面と補強部材111とを一体状に結合したものである。したがって、発泡性基材136、137の発泡による発泡体136a、137aによって中空パネル1の中空室6の内周壁面と補強部材111とを一体状に結合することによって、中空室6内に対し、補強部材111を振動させることなく結合することができ、中空パネル1の補強に効果大きい。また、前記実施の形態4で述べた補強部材111を、実施の形態3で述べた連結手段によって中空パネルの中空室の長手方向に連結可能に構成することも可能である。

【0056】また、図27と図28に示すように、例えば、センタビラーを構成する中空パネル1の上部に対しT字状に交差してルーフサイドパネル（ルーフサイドレールとも言う）が連続している場合などにおいて、その中空パネル1に内装されて補強する補強部材111の上部にルーフサイドパネルの中空室に延びる延長部分を一

体に形成してT字状の交差部を補強することも可能である。この場合、図28に示すように、補強部材111の両外側縦壁部113aの長手方向の両端部を結合している両外側端部120のうち、上の外側端部120には、ルーフサイドパネルの中空室に向けてほぼ水平状に延びる左右の延長部分がそれぞれ形成されている。さらに、補強部材111の両内側縦壁部113bの長手方向の両端部を結合している両内側端部121のうち、上の内側端部121には、前記外側端部120の両延長部分の内側に沿ってほぼ水平状に延びる左右の両延長部分がそれぞれ形成されている。このようにして、補強部材111の上端部において、上の外側端部120aと上の内側端部121aとにそれぞれ延長部分を形成することによって、センタビラーと、ルーフサイドパネルとのT字状の交差部を補強することができる。

【0057】なお、この発明は前記実施の形態1～4に限定するものではない。例えば、前記実施の形態1～4においては、補強部材11（又は、111）と発泡性基材30（又は、130～137）との組み合わせによって補強具10（又は、110）が構成される場合を例示したが、発泡性基材30（又は、130～137）は必ず用いる必要はなく、補強部材11（又は、111）のみによって補強具10（又は、110）を構成してもよい。また、中空パネル1に対し補強部材11（又は、111）を装着するための取付手段としての取付クリップ50（又は、150）に換えてボルト、ナット等を用いることもでき、さらに、補強部材11（又は、111）とは別体の取付クリップを用いてもよい。また、中空構造物が車両ボディのビラー、ロックパネル、ルーフパネル等の中空パネルである場合を例示したが、中空構造物が車両ボディ以外、例えば、建築物、船舶等の建造物を構成する中空構造物であってもよい。

【0058】

【発明の効果】以上述べたように、この発明によれば、補強部材を形成するために必要な材料、例えば合成樹脂材料の使用量を軽減して材料費を削減することができ、その分だけ補強部材を安価に提供することができるばかりでなく、軽量でかつ強固な補強部材を構成することができ、その補強部材によって中空構造物を効率よく補強することができる。

【図面の簡単な説明】

【図1】この発明の実施の形態1の中空構造物の補強具の補強部材と発泡性基材とを分離した状態を示す斜視図である。

【図2】同じく中空パネルの中空室に補強具を装着した状態を示す図1のII-II線に基づく縦断面図である。

【図3】同じく中空パネルの中空室に補強具を装着した状態を示す図2のIII-III線に基づく横断面図で



ある。

【図4】同じく中空パネルの中空室に補強具を装着した状態を示す図2のIV-IV線に基づく横断面図である。

【図5】同じく補強具の発泡性基材が発泡して発泡体となった状態を示す横断面図である。

【図6】同じく補強部材の複数の横壁部が中空室の長手方向に対し斜めの状態で配列された実施態様を示す説明図である。

【図7】同じく複数の横壁部が1つの縦壁部によって連結された実施態様を示す説明図である。

【図8】この発明の実施の形態2の中空構造物の補強具の補強部材と発泡性基材とを分離した状態を示す斜視図である。

【図9】同じく中空パネルの中空室に補強具を装着した状態を示す図8のIX-IX線に基づく横断面図である。

【図10】同じく中空パネルの中空室に補強具を装着した状態を示す図9のX-X線に基づく横断面図である。

【図11】同じく中空パネルの中空室に補強具を装着した状態を示す図9のXI-XI線に基づく横断面図である。

【図12】同じく補強具の発泡性基材が発泡して発泡体となった状態を示す横断面図である。

【図13】この発明の実施の形態3の中空構造物の補強具を示し、所要部の補強部材が連結手段によって長手方向に連結された状態を示す説明図である。

【図14】同じく補強部材の連結手段が係止片と係止孔によって構成された実施態様を示す説明図である。

【図15】同じく補強部材の連結手段がボルト、ナットによって構成された実施態様を示す説明図である。

【図16】同じく補強部材の連結手段が接着剤等の固着手段によって構成された実施態様を示す説明図である。

【図17】この発明の実施の形態4の中空構造物の補強具を構成する補強部材と発泡性基材を分離して示す斜視図である。

【図18】同じく補強部材の一部を上方から示す斜視図である。

【図19】同じく補強部材の一部を下方から示す斜視図である。

【図20】同じく中空パネルの中空室に対し補強部材を

主体とする補強具を装着した状態を示す図18のXX線に基づく縦断面図である。

【図21】同じく中空パネルの中空室に対し補強部材を主体とする補強具を装着した状態を示す図18のXXI線に基づく縦断面図である。

【図22】同じく中空パネルの中空室に対し補強部材を主体とする補強具を装着した状態を示す図18のXXII-XXII線に基づく横断面図である。

【図23】同じく中空パネルの中空室に対し補強部材を主体とする補強具を装着した状態を示す図18のXXIII-XXIII線に基づく横断面図である。

【図24】同じく外部加熱によって発泡性基材が発泡し発泡体となって中空パネルの中空室に対し補強部材を結合するとともに中空室を遮断した状態を示す横断面図である。

【図25】同じく補強部材の所要とする位置に発泡性基材を貼り付けて配設した実施態様を示す横断面図である。

【図26】同じく外部加熱によって発泡性基材が発泡し発泡体となって中空パネルの中空室に対し補強部材を結合するとともに中空室を遮断した状態を示す横断面図である。

【図27】この発明のたの実施の形態を示し、センタビラーと、ルーフサイドパネルとのT字状の交差部に補強部材が配設された状態を示す説明図である。

【図28】同じくT字状の交差部に対応する形状の補強部材を示す斜視図である。

【図29】従来の中空構造物の補強具を示す斜視図である。

#### 【符号の説明】

1 中空パネル（中空構造物）  
6 中空室

10、100 補強具

11、111 補強部材

12、112 横壁部

13、113 縦壁部

14、114 頂部

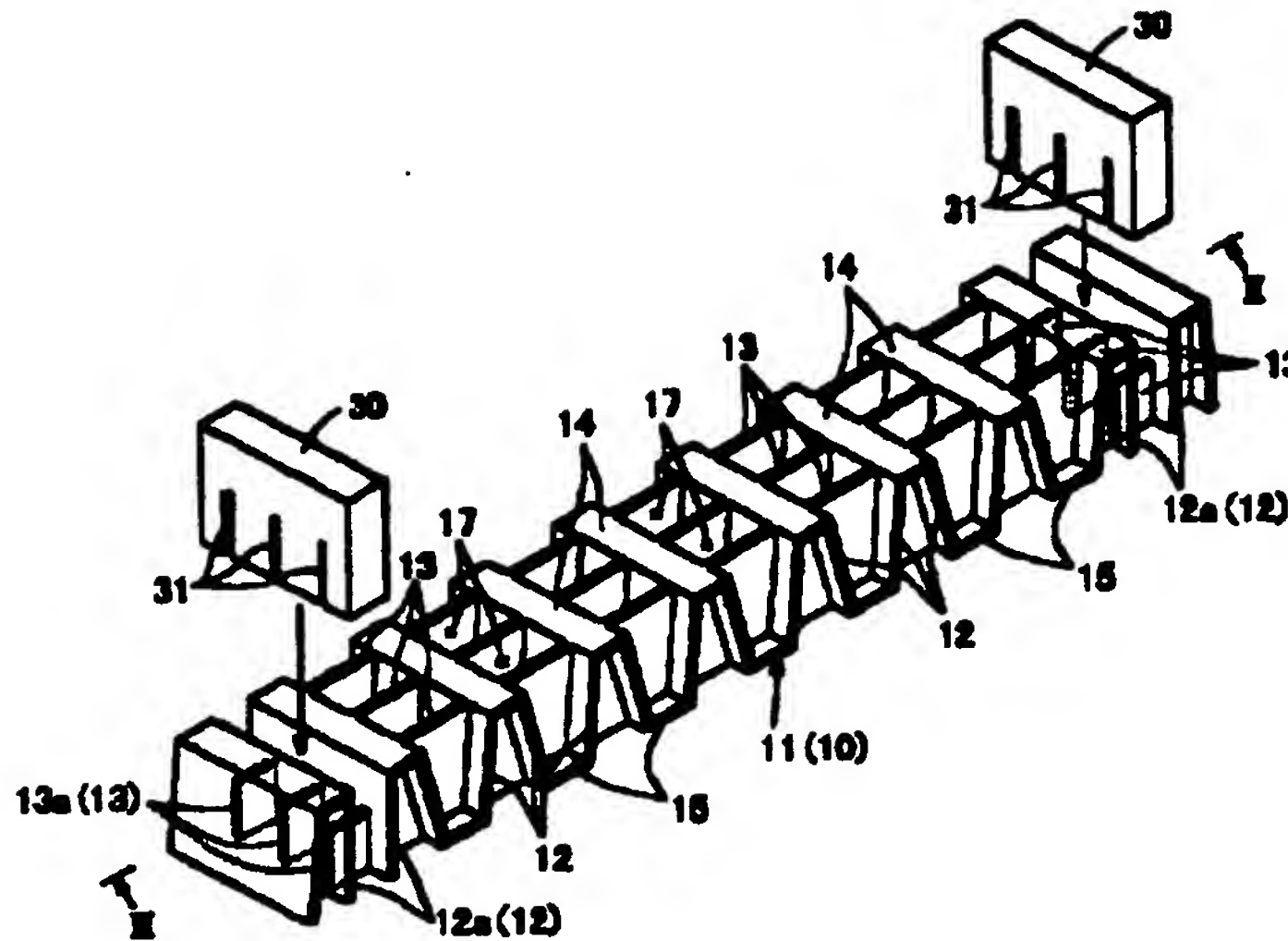
15、115 底部

16、17、116、117 空間部

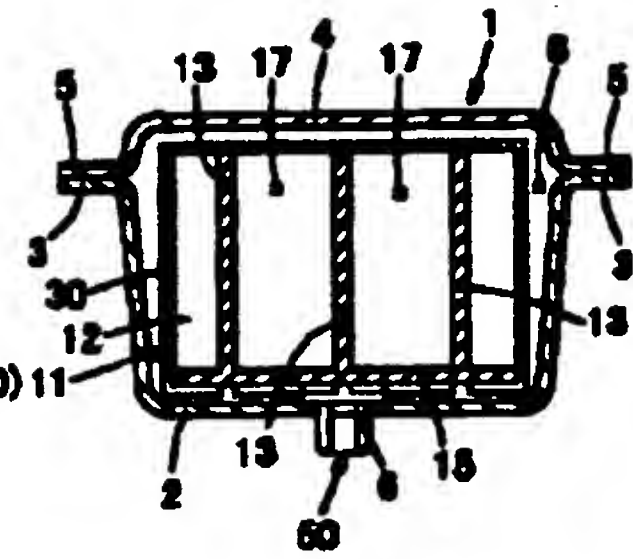
40 30、130～135 発泡性基材

35、138 発泡体

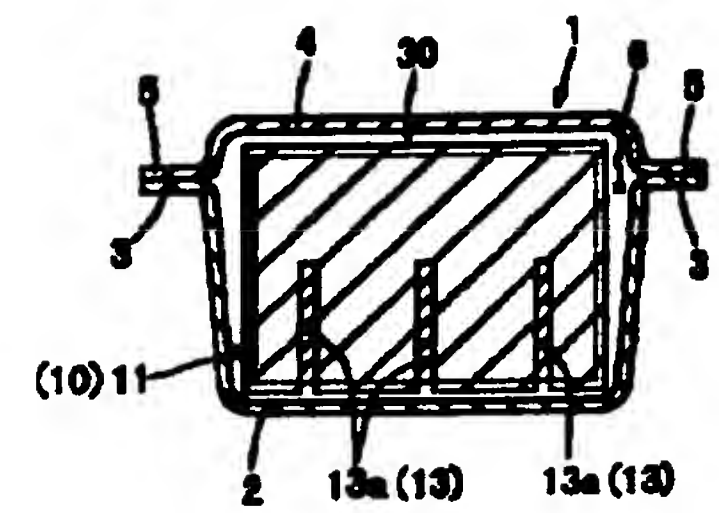
【図1】



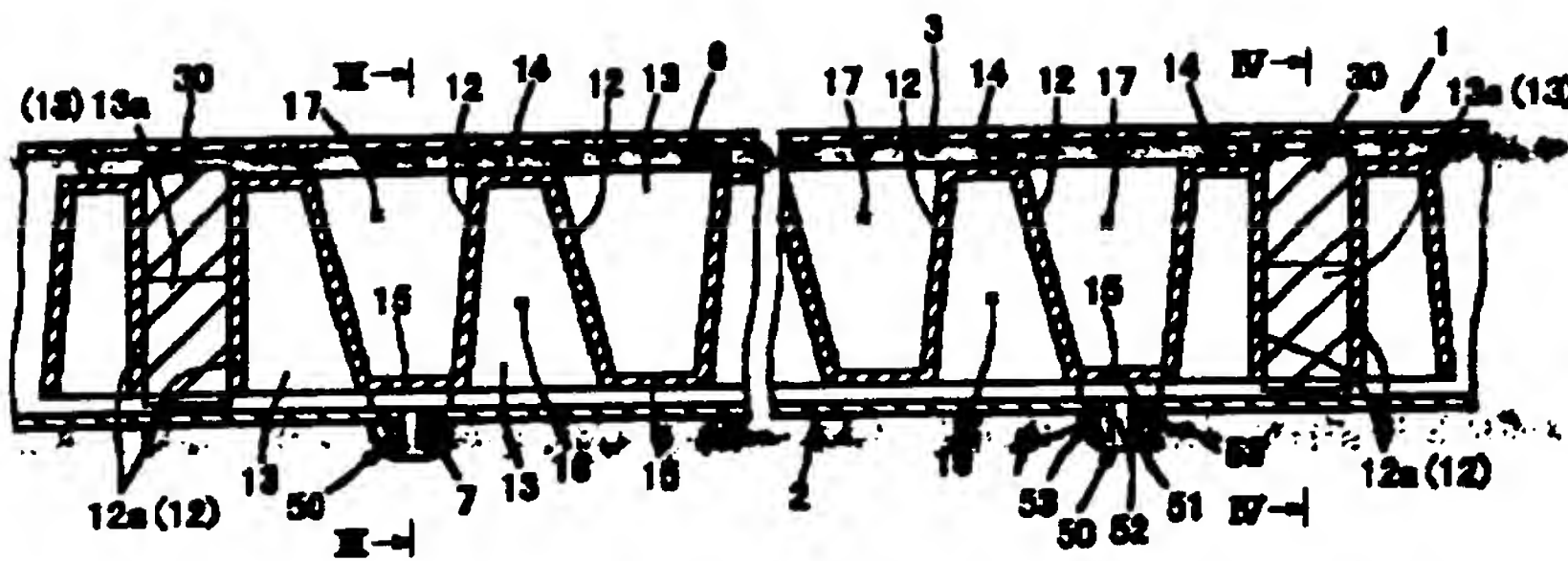
【図3】



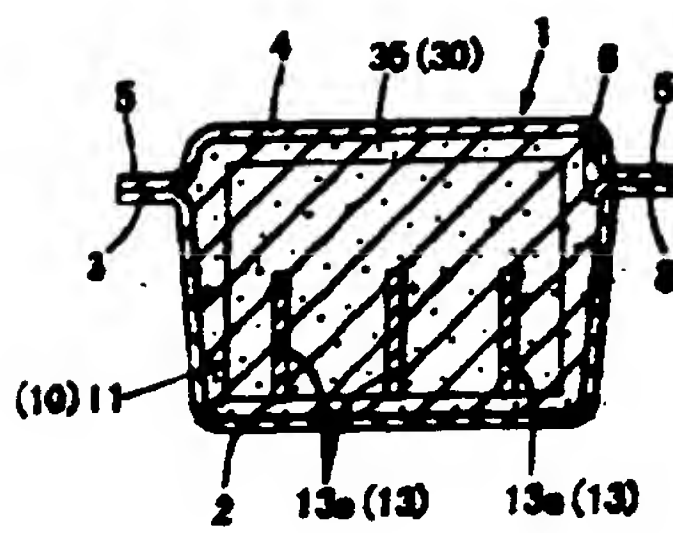
【図4】



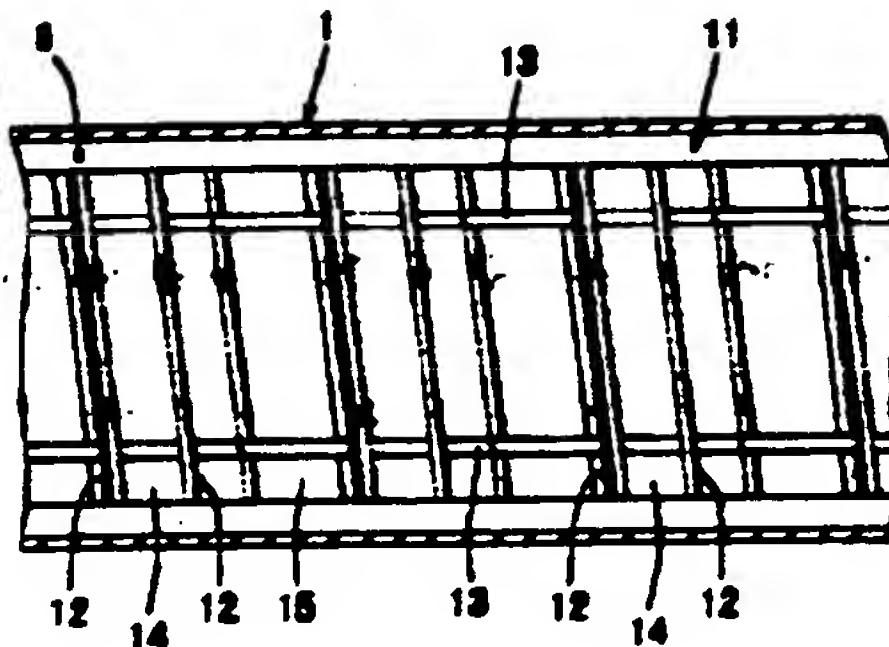
【図2】



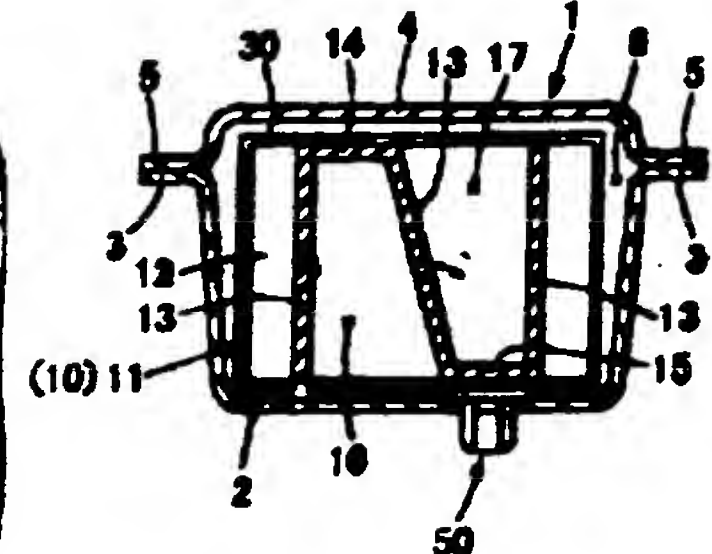
【図5】



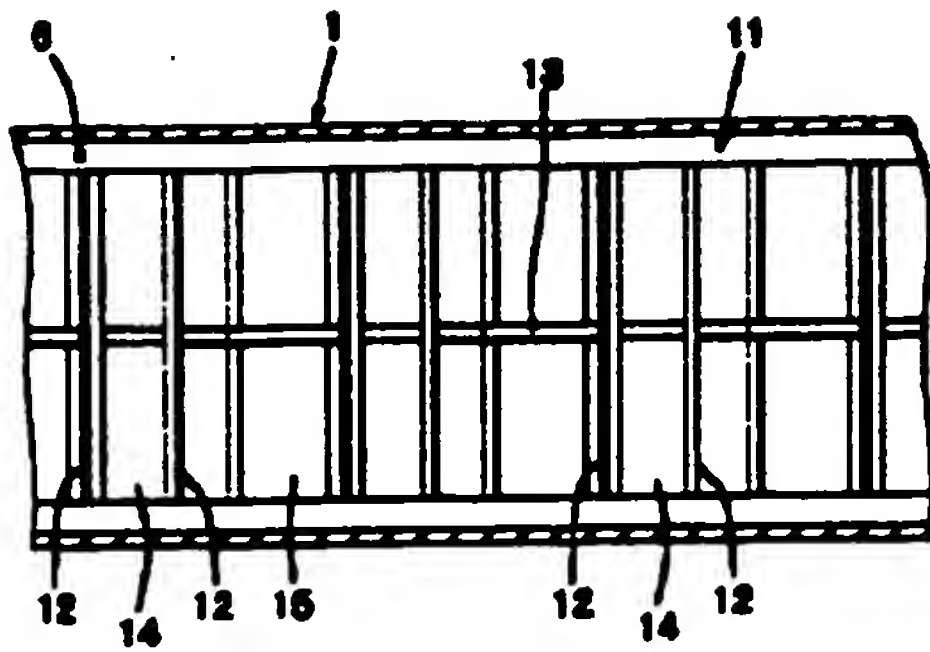
【図6】



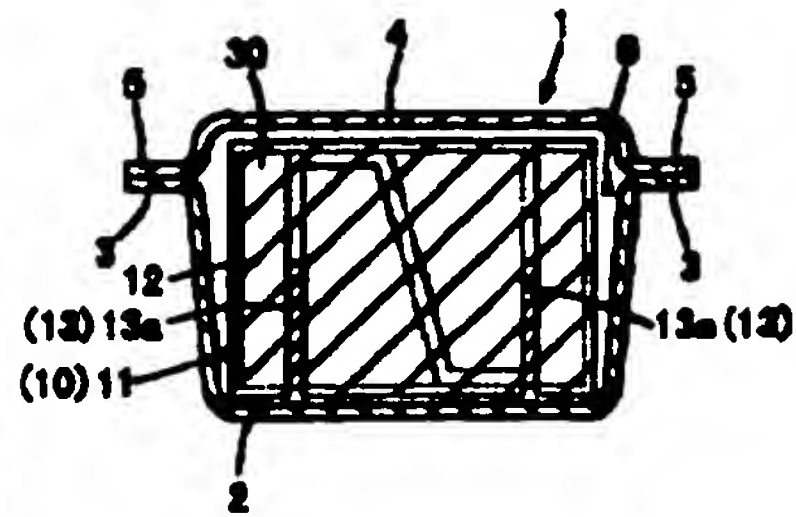
【図10】



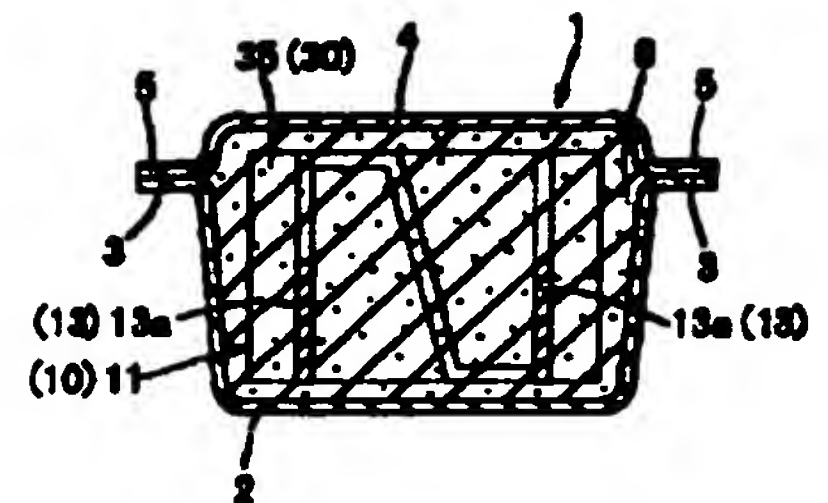
【図7】



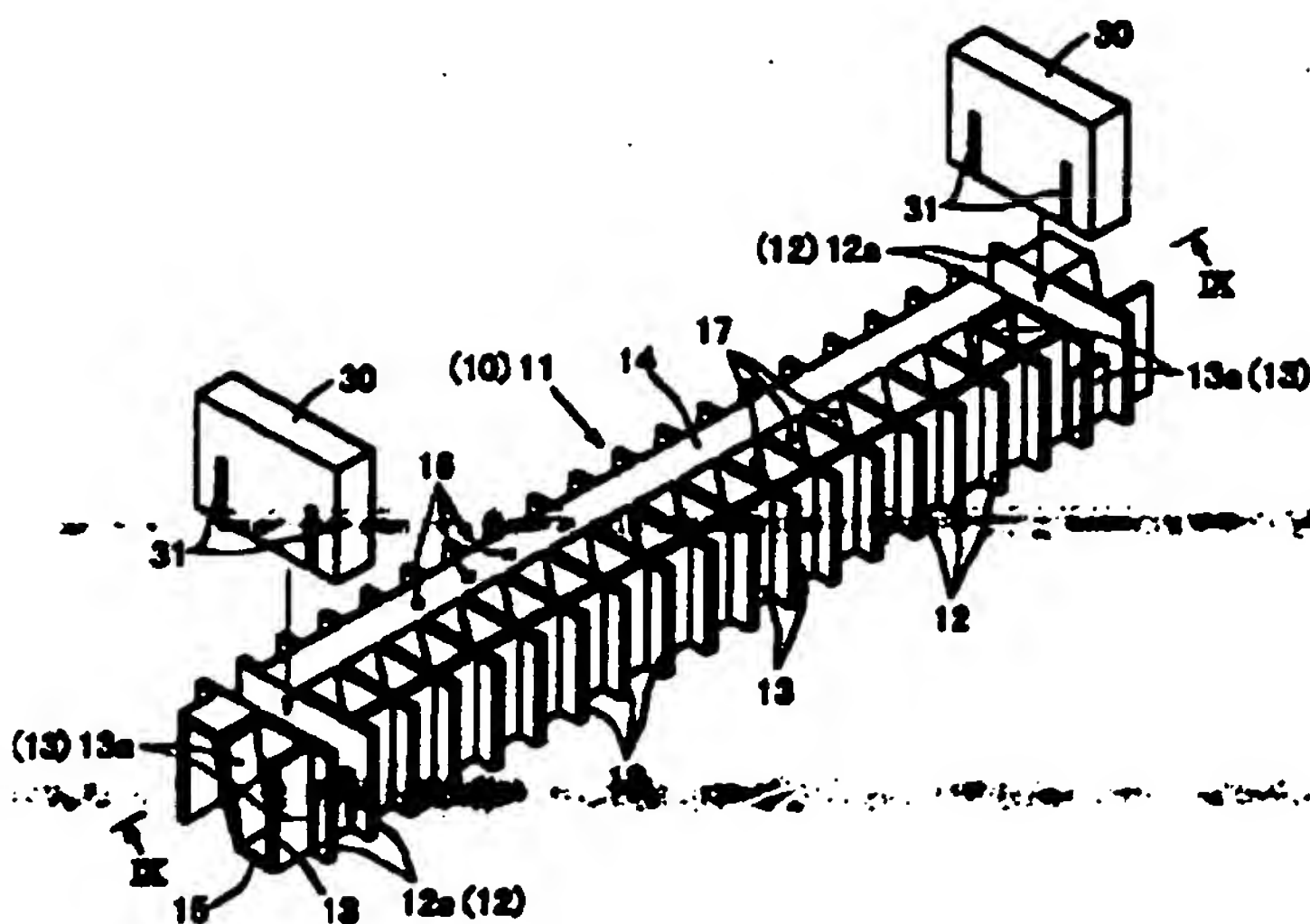
【図11】



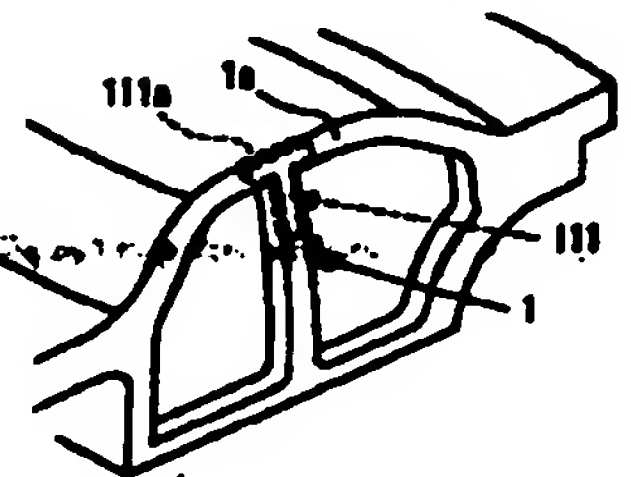
【図12】



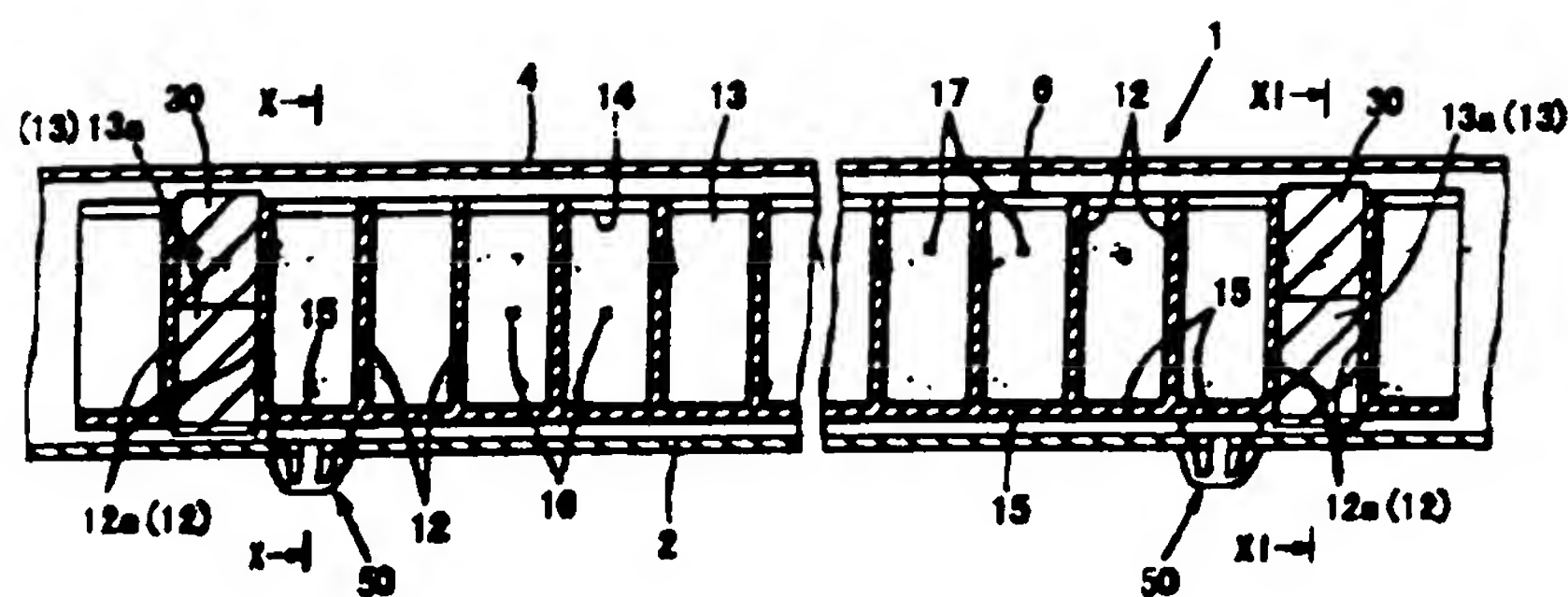
【図8】



【図27】



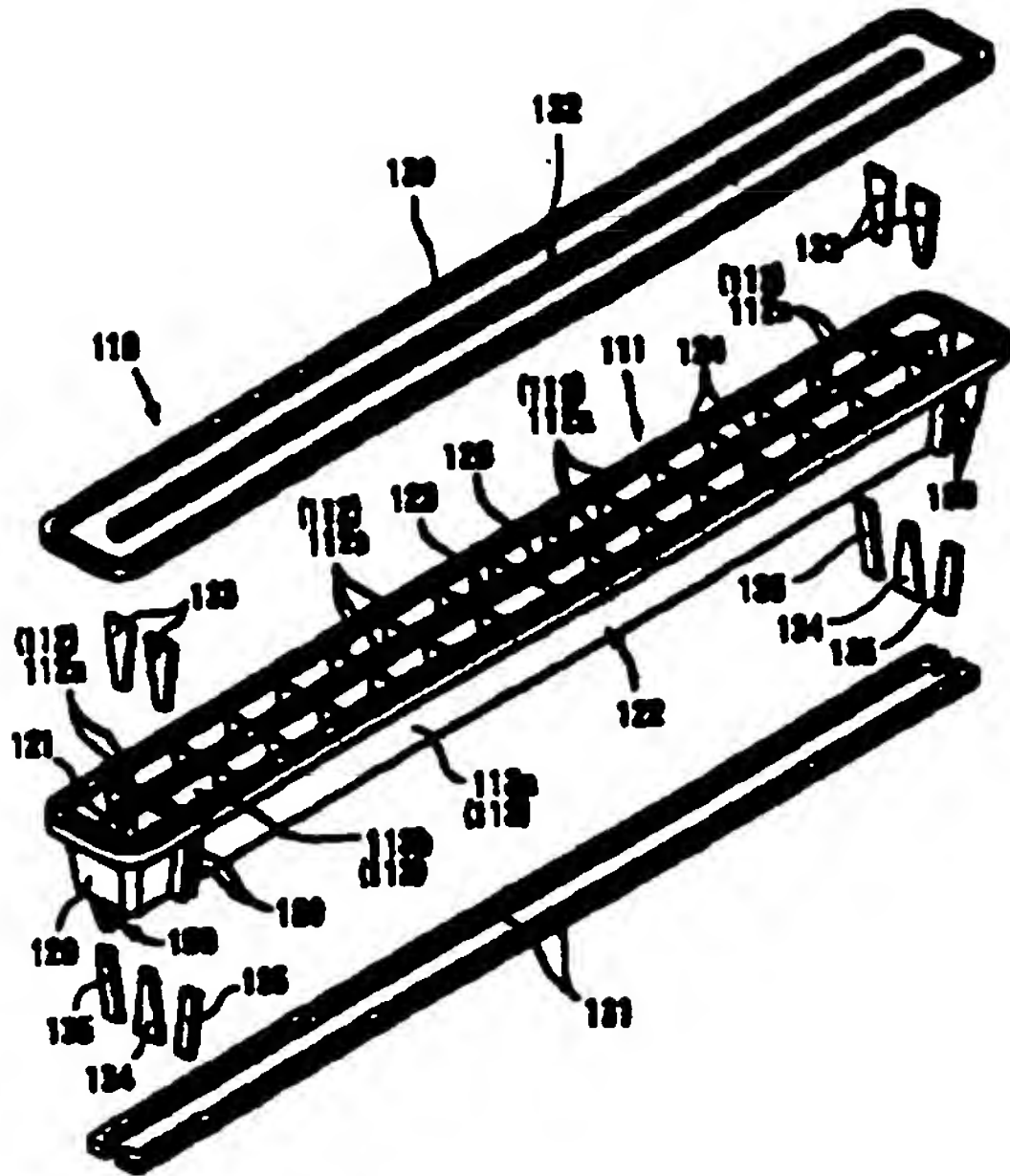
【図9】



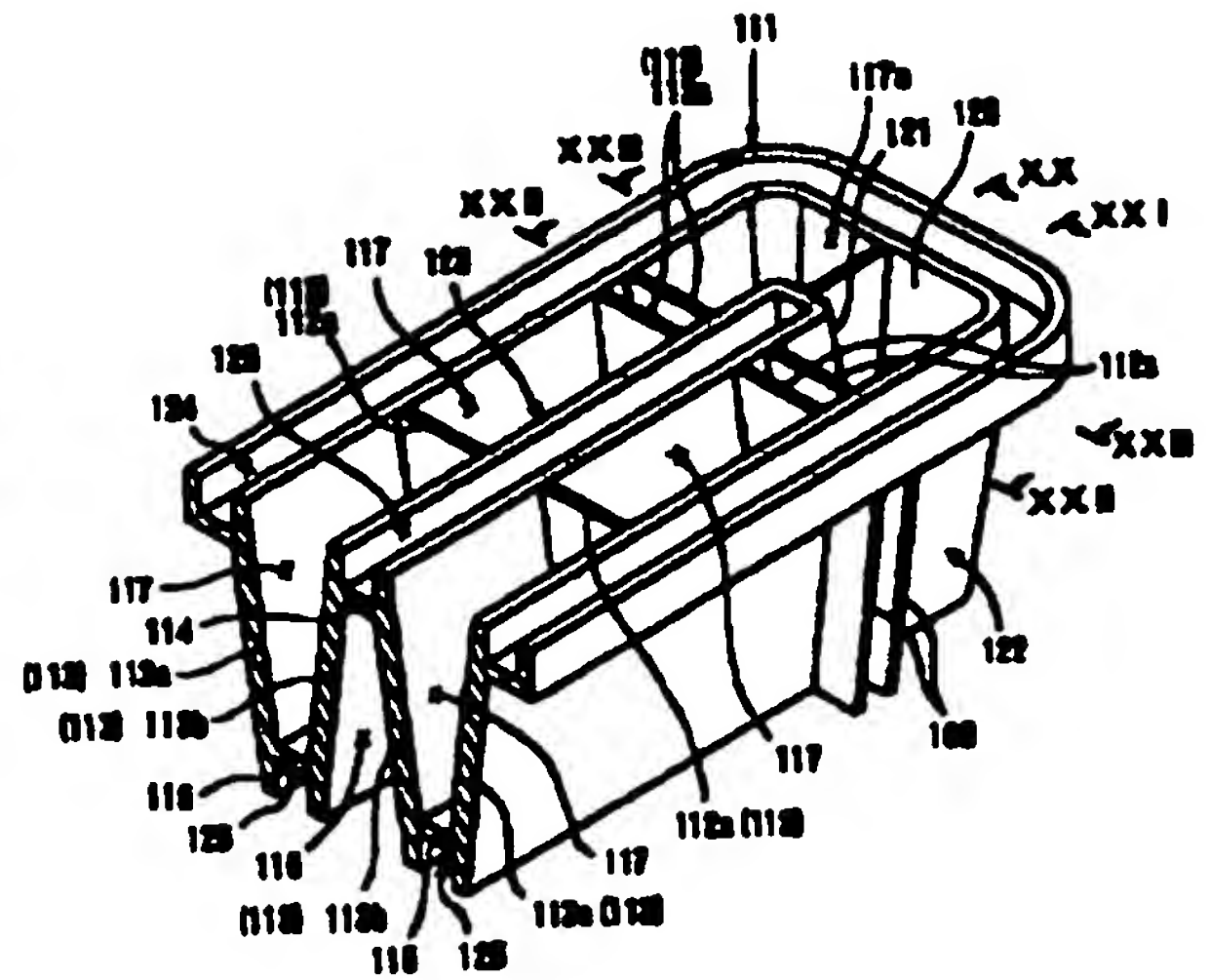




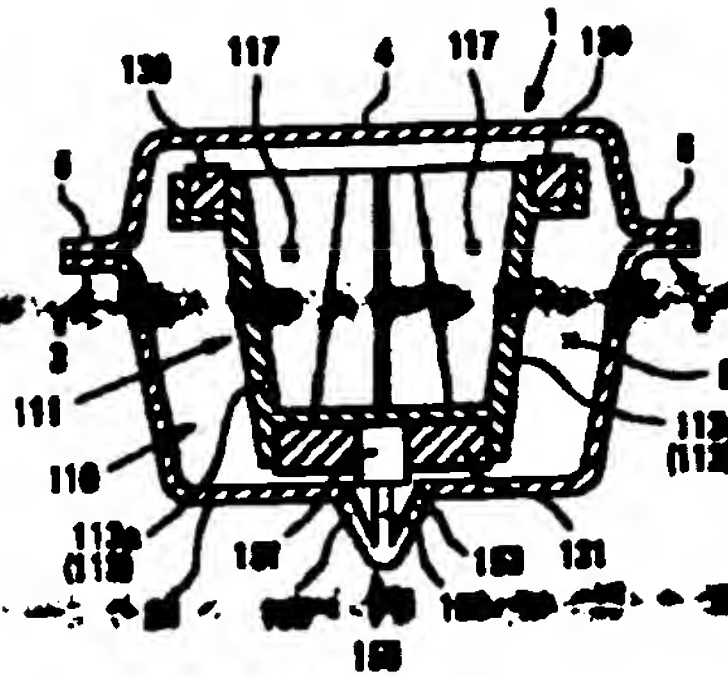
【図17】



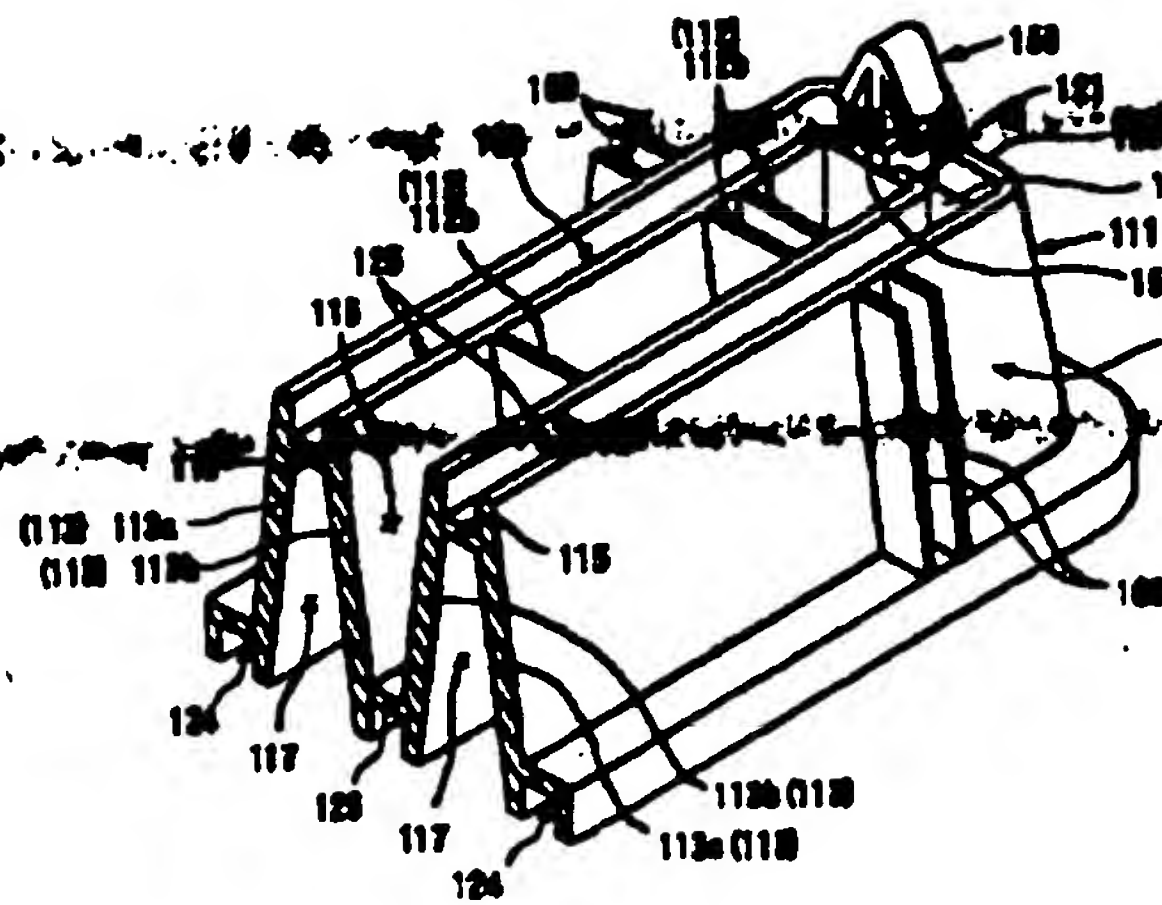
【図18】



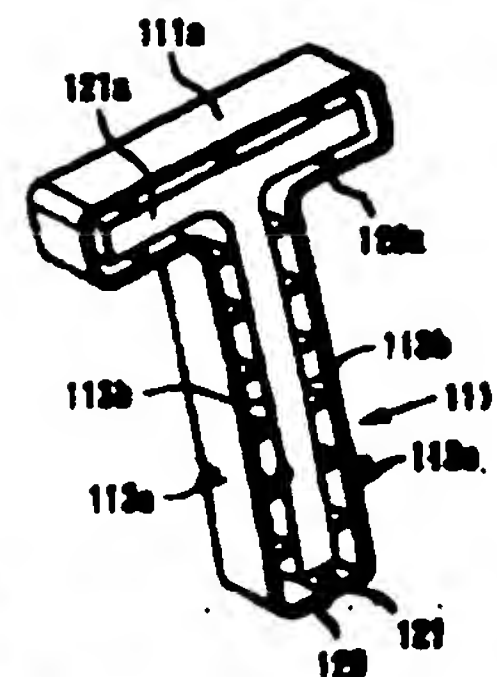
【図23】



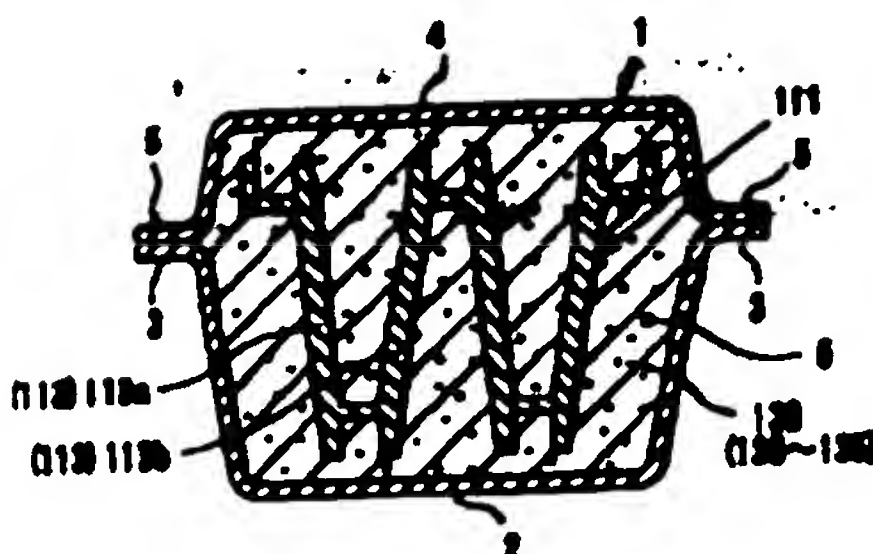
【図19】



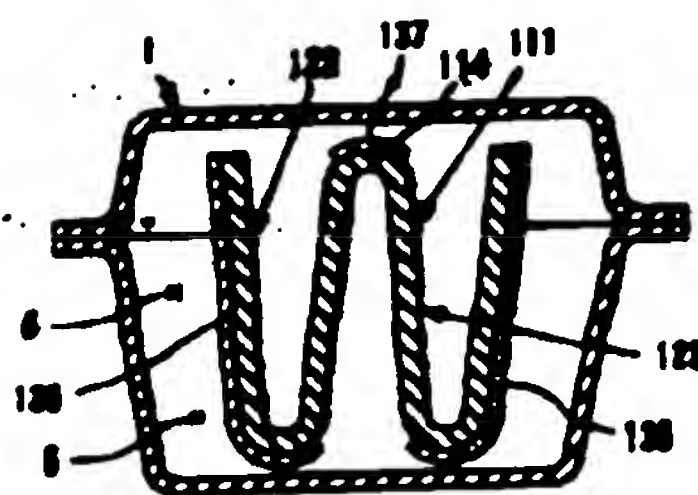
【図28】



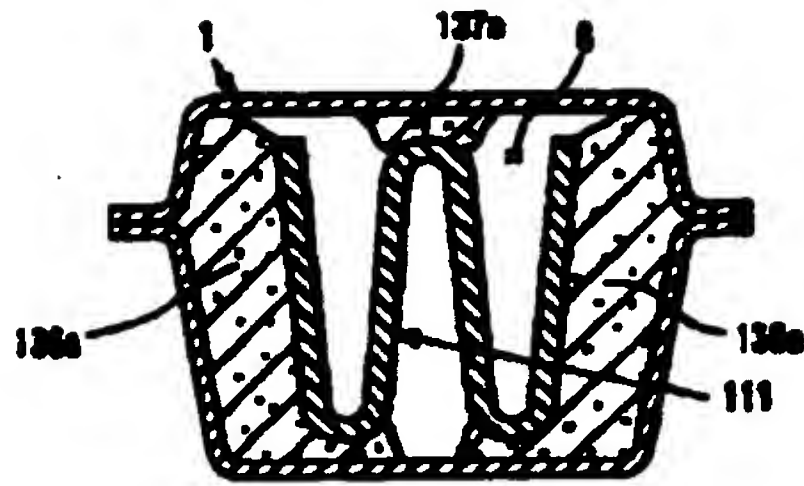
【図24】



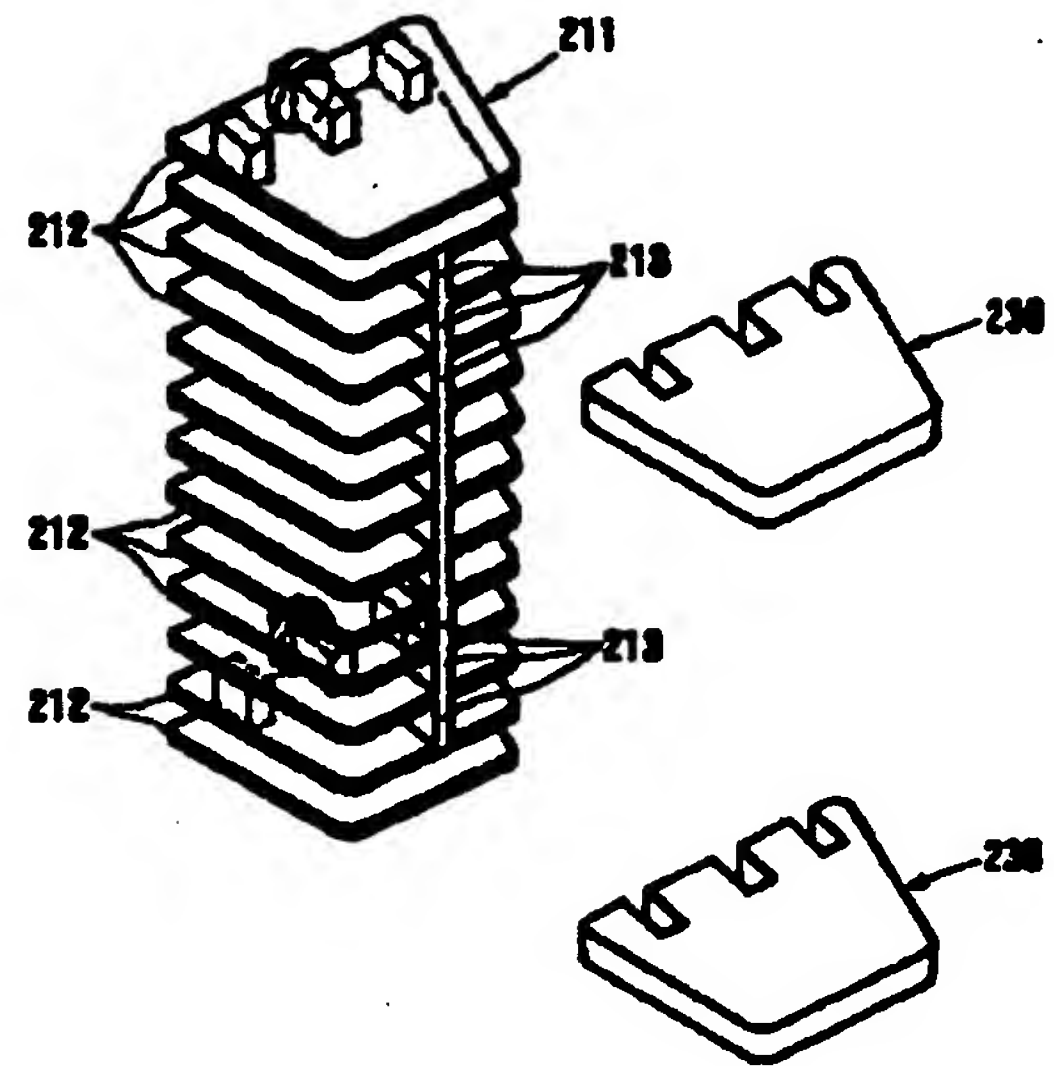
【図25】



【図26】



【図29】



フロントページの続き

Fターム(参考) 3D003 AA01 AA04 BB01 CA17 CA33

CA34 CA35 CA40

4F212 AA11 AA25 AA29 AA34 AB02

AD03 AG03 AG20 AH17 UA09

UB01 UB14 UB22 UG03 UG05

UG07

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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]** It is the reinforcement implement equipped with the reinforcement member with which the hollow room of the hollow structure is equipped and which reinforces said hollow structure. Said reinforcement member Two or more horizontal walls arranged in the longitudinal direction of said hollow room by separating spacing made necessary, The horizontal wall which is equipped with at least one wall section which connects the horizontal wall of these plurality, and adjoins a predetermined horizontal wall and its one side among said two or more horizontal walls The horizontal wall which an other end side becomes large and counters while an end side is narrowly combined by the crowning, and adjoins said predetermined horizontal wall and its opposite side is the reinforcement implement of the hollow structure which an other end side becomes narrow while an end side becomes large and counters, and is combined by the pars basilaris ossis occipitalis. .

~~**[Claim 2]** It is the reinforcement implement equipped with the reinforcement member with which the hollow room of the hollow structure is equipped and which reinforces said hollow structure. Said reinforcement member Two or more horizontal walls arranged in the longitudinal direction of said hollow room by separating spacing made necessary, The horizontal wall which is equipped with two or more wall sections which connect the horizontal wall of these plurality, and adjoins a predetermined horizontal wall and its one side among said two or more horizontal walls The horizontal wall which an other end side becomes large and counters while an end side is narrowly combined by the crowning, and adjoins said predetermined horizontal wall and its opposite side Into the part which the other end side became narrow and was combined by the pars basilaris ossis occipitalis while the end side became large and countered, and was surrounded by two or more of said horizontal wall and said two or more wall sections Reinforcement implement of the hollow structure with which partition formation of the space section which the other end became large, the space section which carries out opening, and the end section became large, opening was carried out, and the other end became [ the end section was closed by said crowning, ] narrow, and was closed with said pars basilaris ossis occipitalis is carried out, respectively .~~

**[Claim 3]** It is the reinforcement implement equipped with the reinforcement member with which the hollow room of the hollow structure is equipped and which reinforces said hollow structure. Said reinforcement member The wall section which is equipped with two or more wall sections prolonged in the longitudinal direction of said hollow room and two or more horizontal walls which connect the wall section of these plurality, and adjoins the predetermined wall section and its one side among said two or more wall sections The wall section which an other end side becomes large and counters while an end side is narrowly combined by the crowning, and adjoins said predetermined wall section and its opposite side Into the part which the other end side became narrow and was combined by the pars basilaris ossis occipitalis while the end side became large and countered, and was surrounded by two or more of said wall section and said two or more horizontal walls Reinforcement implement of the hollow structure with which partition formation of the space section which the other end became large, the space section which carries out opening, and the end section became large, opening was carried out, and the other end



became [ the end section was closed by said crowning, ] narrow, and was closed with said pars basilaris ossis occipitalis is carried out, respectively .

[Claim 4] For the both ends of the longitudinal direction of both the outsides wall section that is the reinforcement implement of the hollow structure according to claim 3, and is located in the both-sides section among two or more wall sections of a reinforcement member, the outside peripheral wall section which is combined with one by the outside terminal wall and makes annular by said both outsides wall section and said both outsides terminal wall is the reinforcement implement of the configuration \*\*\*\*\* hollow structure.

[Claim 5] For the both ends of the longitudinal direction of both the inside wall section that is the reinforcement implement of the hollow structure according to claim 4, and adjoins inside both the outsides wall section of a reinforcement member, the inside peripheral wall section which is combined with one by the inside terminal wall and makes annular along with the inner circumference of the outside peripheral wall section by said both inside wall section and said both inside terminal wall is the reinforcement implement of the configuration \*\*\*\*\* hollow structure.

[Claim 6] The inside terminal wall which makes the outside terminal wall which is the reinforcement implement of the hollow structure according to claim 5, and makes the end section of the outside peripheral wall section, and the end section of the inside peripheral wall section is the reinforcement implement of the hollow structure which has the extension prolonged towards another hollow room which makes the shape of about T characters at the end of a hollow room, and is open for free passage at it, respectively.

[Claim 7] The reinforcement implement of the hollow structure with which it is the reinforcement implement of the hollow structure according to claim 5, and the outside horizontal wall is prepared in one ranging over between the outside wall section of the outside peripheral wall section, and the inside wall sections of the inside peripheral wall section.

~~[Claim 8] The reinforcement implement of the hollow structure with which it is the reinforcement implement of the hollow structure according to claim 5, and the inside horizontal wall is prepared in one ranging over between both the inside wall sections of the inside peripheral wall section.~~

[Claim 9] It is the reinforcement implement of the hollow structure in which it is the reinforcement implement of the hollow structure given in any 1 term of claims 1-8, and the reinforcement member is formed with the synthetic-resin ingredient with which the fiber for strengthening was mixed. .

[Claim 10] Reinforcement implement of the hollow structure with which it is the reinforcement implement of the hollow structure given in any 1 term of claims 1-9, and the reinforcement member is equipped with the fizz base material which combines the inner circle wall side and said reinforcement member of a hollow room of said hollow structure by becoming foam by heat tracing .

[Claim 11] It is the reinforcement implement of the hollow structure made the configuration which is that are the reinforcement implement of the hollow structure according to claim 10, and a fizz base material serves as foam by heat tracing, and intercepts the hollow room of the hollow structure. .

[Claim 12] The reinforcement implement of the hollow structure with which it is the reinforcement implement of the hollow structure according to claim 5, and is equipped with the fizz base material which combines the inner circle wall side and said reinforcement member of a hollow room of said hollow structure by becoming foam by heat tracing [ near the both ends of the height direction of the outside peripheral wall section of a reinforcement member ].

[Claim 13] The reinforcement implement of the hollow structure with which it is the reinforcement implement of the hollow structure according to claim 12, and the crevice for holding a fizz base material near the both ends of the height direction of the outside peripheral wall section of a reinforcement member is prepared almost annularly along with this outside peripheral wall section.

[Claim 14] It is the reinforcement implement of the hollow structure from which it is the reinforcement implement of the hollow structure according to claim 1 to 13 and which the reinforcement member consists of possible [ connection ] with the connection means in another reinforcement member to the edge.



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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the reinforcement implement of the hollow structure for reinforcing the hollow panels (for example, the center pillar of the car body, a front pillar, a quota pillar, a roof side panel, a rocker panel, etc.) constituted by the cube type closing cross section in the air mainly by two or more panels about the reinforcement implement of the hollow structure.

[0002]

[Description of the Prior Art] It was common to have installed the metal RIINHOSUMENTO panel inside between the inner panels and outer panels which constitute a hollow panel, and to have reinforced the hollow panel as a reinforcement structure of the hollow panel of the car body, conventionally.

However, if a hollow panel is reinforced by the metal RIINHOSUMENTO panel, the weight of a hollow panel will increase sharply and will have a bad influence on fuel consumption etc. Since it is such, in order to suppress the increment in weight of a hollow panel and to reinforce a hollow panel, as shown in drawing 29, installing the reinforcement member 211 made of synthetic resin inside the hollow room of a hollow panel, and reinforcing a hollow panel is known. That is, the reinforcement member 211 made of synthetic resin is equipped with the piece 213 of connection which maintains predetermined spacing and connects with one two or more reinforcement plates 212 which intersect perpendicularly with the longitudinal direction of a hollow room, respectively, and two or more of these reinforcement plates 212.

[0003] Moreover, between the reinforcement plate 212 of both ends, and the reinforcement plate 212 which adjoins these reinforcement plate 212, respectively, the fizz base material 230 is inserted and held among two or more reinforcement plates 212 of the reinforcement member 211. And the periphery section of the foam pastes the inner skin of a hollow panel by the fizz base material 230 foaming and becoming foam by heat tracing. As a reinforcement implement of the hollow structure with such structure, it is indicated by JP,10-53156,A, for example.

[0004]

[Problem(s) to be Solved by the Invention] By the way, in the reinforcement implement of said conventional hollow structure, the reinforcement member 211 constituted by the piece 213 of connection which maintains two or more reinforcement plates 212 which intersect perpendicularly with the longitudinal direction of a hollow room, respectively, and two or more of these reinforcement plates 212, and connects predetermined spacing serves as structure which it bends and is easy to deform in the piece 213 of connection. For this reason, there was a trouble that reinforcement of the hollow structure became weak to the direction where the piece 213 of connection bends. Moreover, if the spacing dimension of the reinforcement plate 212 is made small and only the part shortens the piece 213 of connection, the piece 213 of connection will stop being able to bend easily. However, if the spacing dimension of the reinforcement plate 212 is made small and the number of sheets of the reinforcement plate 212 is increased, a lot of synthetic-resin ingredients will be needed, and it will become cost quantity. Furthermore, if the spacing dimension of the reinforcement plate 212 is made small, it may

become difficult from a die to unmold a reinforcement member.

[0005] The purpose of this invention is offering the reinforcement implement of the hollow structure with which a firm lightweight and reinforcement member's can be constituted and the hollow structure's can be efficiently reinforced by that reinforcement member in view of said conventional trouble.

[0006]

[Means for Solving the Problem] In order to attain said purpose, the reinforcement implement of the hollow structure concerning the 1st invention makes a summary the configuration of a passage according to claim 1. Therefore, according to the 1st invention, two or more horizontal walls of a reinforcement member are combined by a crowning and the pars basilaris ossis occipitalis, respectively, the shape of one is connected with a longitudinal direction by the wall section in nothing and the horizontal wall of these plurality, and the reinforcement member is constituted. Thus, the constituted reinforcement member will become lightweight while being able to reduce by the space section between adjoining horizontal walls, the ingredient, for example, the synthetic-resin ingredient, for forming this reinforcement member. Moreover, for example, when forming a reinforcement member with injection molding, a reinforcement member can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls is prevented by the wall section, a crowning, and the pars basilaris ossis occipitalis, and bending deformation of the wall section is prevented by two or more horizontal walls, crownings, and partes basilaris ossis occipitalis. For this reason, a reinforcement member serves as structure which cannot deform easily to the load from many.

[0007] Moreover, the reinforcement implement of the hollow structure concerning the 2nd invention makes a summary the configuration of a passage according to claim 2. The reinforcement implement of the hollow structure concerning the 3rd invention makes a summary the configuration of a passage according to claim 3. Therefore, the end section is closed with a crowning by the part which was surrounded by two or more horizontal walls of a reinforcement member, and two or more wall sections

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according to the 2nd and 3rd invention, and the reinforcement member is constituted from partition formation of the space section which the other end becomes large and carries out opening, and the space section which the end section becomes large and carries out opening and by which the other end was plugged up with the pars basilaris ossis occipitalis being carried out, respectively. Thus, the constituted reinforcement member will become lightweight while being able to reduce by the space section by which partition formation was carried out, the ingredient, for example, the synthetic-resin ingredient, for forming this reinforcement member. Moreover, for example, when forming a reinforcement member with injection molding, a reinforcement member can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls is prevented by two or more wall sections, crownings, and partes basilaris ossis occipitalis, and bending deformation of two or more wall sections is prevented by two or more horizontal walls, crownings, and partes basilaris ossis occipitalis. For this reason, a reinforcement member serves as structure which cannot deform easily to the load from many.

[0008] Moreover, for the both ends of the longitudinal direction of both the outsides wall section that the reinforcement implement of the hollow structure concerning the 4th invention makes a summary the configuration of a passage according to claim 4, and is located in the both-sides section among two or more wall sections of a reinforcement member, the outside peripheral wall section which is combined with one by the outside terminal wall and makes annular by said both outsides wall section and said both outsides terminal wall is configuration \*\*\*\*\*. Thus, by constituting the outside peripheral wall section in which it is combined with one by the outside terminal wall, and both the outsides wall section of a reinforcement member makes annular by it, it becomes the structure which cannot deform a reinforcement member easily, and reinforcement reinforcement is raised.

[0009] Moreover, the reinforcement implement of the hollow structure concerning the 5th invention Make the configuration of a passage according to claim 5 into a summary, and the both ends of the longitudinal direction of both the inside wall section that adjoins inside both the outsides wall section of a reinforcement member are combined with one by the inside terminal wall. The inside peripheral wall section which makes annular along with the inner circumference of the outside peripheral wall section by said both inside wall section and said both inside terminal wall is configuration \*\*\*\*\*. Thus, by



constituting the outside peripheral wall section in which it is combined with one by the outside terminal wall, and both the outside wall section of a reinforcement member makes annular by it, and both the inside wall section of this reinforcement member being combined with one by the inside terminal wall, and constituting the inside peripheral wall section, a reinforcement member serves as structure which cannot deform much more easily, and reinforcement reinforcement is further raised to fitness.

[0010] Moreover, the reinforcement implement of the hollow structure concerning the 6th invention makes a summary the configuration of a passage according to claim 6, and the inside terminal wall which makes the outside terminal wall which makes the end section of the outside peripheral wall section of a reinforcement member, and the end section of the inside peripheral wall section has the extension prolonged towards another hollow room which makes the shape of about T characters at the end of a hollow room, and is open for free passage at it, respectively. Therefore, also in the part concerned, it can reinforce by extending towards another hollow room which each extension of the outside terminal wall which makes the end section of the outside peripheral wall section of a reinforcement member, and the inside terminal wall which makes the end section of the inside peripheral wall section makes the shape of about T characters at the end of a hollow room, and opens for free passage at it. For example, also in the intersection of the shape of T character of the center pillar of a car, and a roof side panel (it is also called a roof side rail) etc., it can reinforce good.

[0011] Moreover, the reinforcement implement of the hollow structure concerning the 7th invention makes a summary the configuration of a passage according to claim 7, and the outside horizontal wall is prepared in one ranging over between the outside wall section of the outside peripheral wall section, and the inside wall sections of the inside peripheral wall section. Moreover, the reinforcement implement of the hollow structure concerning the 8th invention makes a summary the configuration of a passage according to claim 8, and the inside horizontal wall is prepared in one ranging over between both the inside wall sections of the inside peripheral wall section.

[0012] Moreover, the reinforcement implement of the hollow structure concerning the 9th invention is that a reinforcement member is formed with the synthetic-resin ingredient with which the configuration of a passage according to claim 9 is made into a summary, and \*\* and the fiber for strengthening were mixed, and serves as firm structure which cannot deform a reinforcement member much more easily.

[0013] Moreover, the reinforcement implement of the hollow structure concerning the 10th invention Since the configuration of a passage according to claim 10 is made into a summary, and a fizz base material foams by heat tracing, it becomes foam and the inner circle wall side and reinforcement member of a hollow room are combined by the foam in the shape of one, It can fix firmly, without vibrating a reinforcement member in the clearance between the inner circle wall side of a hollow room, and a reinforcement member, and effectiveness is large to reinforcement of the hollow structure.

[0014] Moreover, since the reinforcement implement of the hollow structure concerning the 11th invention makes a summary the configuration of a passage according to claim 11, and a fizz base material foams to it by \*\* and heat tracing, it serves as foam and a hollow room can be intercepted by the foam, improvement in the vibration-deadening nature of the hollow structure or insulation can be aimed at.

[0015] Moreover, the reinforcement implement of the hollow structure concerning the 12th invention makes a summary the configuration of a passage according to claim 12, and [ near the both ends of the height direction of the outside peripheral wall section of a reinforcement member ], it is becoming foam by heat tracing, and is equipped with the fizz base material which combines the inner circle wall side and said reinforcement member of a hollow room of said hollow structure. Therefore, the fizz base material near the both ends of the height direction of the outside peripheral wall section foams, respectively, serves as foam, and can combine the perimeter of the both ends of the height direction of the outside peripheral wall section of a reinforcement member, and the inner circle wall side of the hollow structure. For this reason, in a reinforcement member, it can respond to the load which acts on the hollow structure through each foam, and effectiveness is large to reinforcement of the hollow structure.

[0016] Moreover, the reinforcement implement of the hollow structure concerning the 13th invention

makes a summary the configuration of a passage according to claim 13, and the crevice for holding a fizz base material is prepared almost annularly along with this outside peripheral wall section near the both ends of the height direction of the outside peripheral wall section of a reinforcement member. Therefore, in case each fizz base material foams, the foaming direction of each fizz base material is regulated by the medial surface of each crevice, and it becomes possible to make each [ these ] fizz base material turn and foam to the inner circle wall side of the hollow structure. For this reason, the foam by foaming of each fizz base material can paste up that there is no clearance in the inner circle wall side of the hollow structure, and can combine certainly the inner circle wall side and reinforcement member of the hollow structure by this.

[0017] Moreover, the reinforcement implement of the hollow structure concerning the 14th invention can make a summary the configuration of a passage according to claim 14, and can reinforce the hollow structure with another reinforcement member being connected with the edge of a reinforcement member by the connection means easily covering the die length considered as a request. Moreover, it becomes possible to form the reinforcement member of a simple substance in short length, and only the part which short-length-ized the reinforcement member becomes easy [ manufacture, storage, conveyance, handling, etc. ].

[0018]

[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt 1 of implementation of this invention is explained according to drawing 1 - drawing 5 . In drawing 2 and drawing 3 , the hollow panel (for example, center pillar) 1 is that SUPPOTO welding of the inner panel 2 and the outer panel 4 is carried out by the mutual flanges 3 and 5, and is constituted by the cube type closing cross section in the air. The mounting hole 7 is formed in the predetermined location of the vertical section at the inner panel 2. In the hollow room 6, it is equipped with the reinforcement implement 10 and said hollow panel 1 is reinforced.

[0019] As shown in drawing 1 and drawing 2 , said reinforcement implement 10 is equipped with the reinforcement member 11 with which has the die-length dimension made necessary at the longitudinal direction of the hollow room 6 of the hollow panel 1, and it is equipped in the hollow room 6 by the attachment means and which reinforces the hollow panel 1, and the fizz base material 30 arranged in the predetermined location of the reinforcement member 11. Said reinforcement member 11 equips one with two or more horizontal walls 12 arranged by separating spacing which has a predetermined clearance between the inner circle wall sides of the hollow room 6 of the hollow panel 1, and is made necessary at the longitudinal direction of the hollow room 6, and two or more wall sections 13 which connect the horizontal wall 12 of these plurality. Moreover, said reinforcement member 11 consists of hard synthetic resin which has thermal resistance, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. As a hard synthetic-resin ingredient, PA (polyamide), PBT (polybutylene terephthalate), PET (polyethylene terephthalate), PP (polypropylene), PPS (polyphenylene sulfide), etc. are used, for example. Moreover, as fiber for strengthening, a glass fiber, carbon fiber, Kevlar fiber, etc. are used, for example. Furthermore, the mixing rate of strengthening fiber to a hard synthetic-resin ingredient is desirably set as 30 - 40% of the weight of a mixing rate five to 65% of the weight.

[0020] The other end side (it goes to drawing 2 and is the bottom) became large, and the horizontal wall 12 which adjoins the predetermined horizontal wall 12 and its one side among two or more horizontal walls 12 of said reinforcement member 11 has countered in the shape of [ of abbreviation Ha ] a character while an end side (it goes to drawing 2 and is the bottom) is narrowly combined by the crowning 14. Moreover, while the horizontal wall 12 which adjoins said predetermined horizontal wall 12 and its opposite side becomes large and an end side (it goes to drawing 2 and is the bottom) counters in the shape of [ of abbreviation reverse Ha ] a character, the other end side (it goes to drawing 2 and is the bottom) is narrowly combined by the pars basilaris ossis occipitalis 15. and into the part surrounded by said two or more horizontal walls 12 and two or more wall sections 13 The space section 16 which an end side (it goes to drawing 2 and is the bottom) is narrowly closed with a crowning 14, and an other end side (it goes to drawing 2 and is the bottom) becomes large, and carries out opening, An end side (it



goes to drawing 2 and is the bottom) becomes large, opening is carried out, the space section 17 by which the other end side (it goes to drawing 2 and is the bottom) was narrowly closed with the pars basilaris ossis occipitalis 15 adjoins the longitudinal direction of the hollow room 6 by turns, and partition formation is carried out. moreover, the opposite include angle of said adjoining horizontal wall 12 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably. If the opposite include angle of the adjoining horizontal wall 12 turns into 5 or less times, it may become difficult to unmold the reinforcement member 11 from the die for injection molding. Moreover, if the opposite include angle of the adjoining horizontal wall 12 becomes large at 60 degrees or more, the number of arrangement of the horizontal wall [ / in the die length made necessary ] 12 decreases, and the firm reinforcement member 11 may be unable to be fabricated. However, horizontal wall 12a of a part in which the fizz base material 30 explained in full detail behind is arranged is making the letter of abbreviation parallel.

[0021] Moreover, in the gestalt 1 of this operation, as shown in drawing 2 , the attachment clip 50 as an attachment means to be inserted in the mounting hole 7 of the inner panel 2, and to engage with the inferior surface of tongue of the pars basilaris ossis occipitalis 15 located in the both-ends approach of the reinforcement member 11 elastically is formed in the shape of one. This attachment clip 50 is equipped with the piece 53 of a stop of the pair which extends in the shape of a cuff and engages with a mounting hole 7 elastically from the tip of the seat 51 prepared in the pars basilaris ossis occipitalis 15, the leg 52 which is projected from that seat 51 and inserted in a mounting hole 7, and its leg 52.

[0022] Moreover, in the gestalt 1 of this operation, horizontal wall 12a which is located in the both-ends approach of the reinforcement member 11 among two or more horizontal walls 12 of said reinforcement member 11, and adjoins, respectively made the letter of abbreviation parallel, and has countered.

Furthermore, between horizontal wall 12a which these-adjoins, a crowning 14 or a pars basilaris ossis occipitalis 15 is not formed, and, moreover, the height dimension of wall section 13a is also low. And

between the horizontal wall 12a concerned, the fizz base material 30 for foaming by heat tracing, becoming foam 35, and combining the inner circle wall side and the reinforcement member 11 of the hollow panel 1 in the shape of one, and intercepting the hollow room 6 is formed, respectively.

[0023] Said fizz base material 30 is formed in the configuration which consists of a fizz ingredient of the synthetic-resin system of foaming agent mixing to which it foams by heat tracing, and is made necessary with injection molding etc. And the groove cut section 31 inserted in wall section 13a is formed in the predetermined location of the fizz base material 30. Moreover, as for the fizz base material 30, it is desirable to be formed from the fizz ingredient which uses as a principal component the synthetic resin which has an adhesive property to a metal side or a synthetic-resin side, fibrous material for strengthening like a foaming agent and a glass fiber etc. is mixed by this, foams with the heat at the time of being the baking finish of the car body (for example, temperature around 110 degrees C - 190 degrees C), and serves as foam of high rigidity. As a fizz ingredient which has such an adhesive property and serves as foam of high rigidity, it is indicated by JP,8-208871,A, JP,11-158313,A, etc., for example.

[0024] It intercepts the hollow room 6 while it is equipped with it in the hollow room 6 of the hollow panel 1 as the reinforcement implement 10 equipped with the reinforcement member 11 and the fizz base material 30 as described above is described below, and it reinforces the hollow panel 1. That is, before carrying out spot welding of the inner panel 2 and the outer panel 4 which constitute the hollow panel 1 in the mutual flanges 3 and 5 first when equipping with the reinforcement implement 10 to the hollow room 6 of the hollow panel 1 as shown in drawing 2 and drawing 3 , in the attachment clip 50 of the reinforcement member 11, it is equipped with the reinforcement implement 10 to the mounting hole 7 of the inner panel 2. Then, in the mutual flanges 3 and 5, spot welding of the inner panel 2 and the outer panel 4 is carried out, and the hollow panel 1 which makes a cube type closing cross section in the air is constituted.

[0025] Here, the fizz base material 30 of the both-ends approach of the reinforcement member 11 foams, respectively, and serves as foam 35 with heating from the outside, for example, the heat tracing in the case of the baking finish of the car body which has said hollow panel 1, (refer to drawing 5 ). In case the fizz base material 30 foams, the both-sides side of the fizz base material 30 is supported by adjoining



horizontal wall 12a, respectively. for this reason, the direction which foaming of the fizz base material 30 to the longitudinal direction of the hollow room 6 is restricted, and intersects perpendicularly with a longitudinal direction -- receiving -- foaming is promoted. And the foam 35 by foaming of the fizz base material 30 pastes each that there is no clearance in the inner circle wall side of the hollow room 6.

While the hollow panel 1, an inner circle wall side, and the reinforcement member 11 are combined in the shape of one by this and the hollow panel 1 is reinforced, the hollow room 6 is intercepted.

[0026] In the reinforcement member 11 made of synthetic resin which makes the body part of said reinforcement implement 10, into the part surrounded by two or more of the horizontal walls 12 and two or more wall sections 13 The end section is closed by the crowning 14 and it consists of that the space section 16 which the other end becomes large and carries out opening, and the space section 17 which the end section becomes large and carries out opening and by which the other end was plugged up with the pars basilaris ossis occipitalis 15 adjoin the longitudinal direction of the hollow room 6 by turns, and partition formation is carried out. Thus, the constituted reinforcement member 11 will become lightweight while being able to reduce the synthetic-resin ingredient for fabricating this reinforcement member 11 by the space sections 16 and 17 by which adjoined the longitudinal direction of the hollow room 6 by turns, and partition formation was carried out.

[0027] Moreover, when fabricating the reinforcement member 11 with injection molding, since the opening side makes the shape of a large taper, each space sections 16 and 17 can unmold the reinforcement member 11 easily from the die for injection molding. Moreover, bending deformation of two or more horizontal walls 12 is prevented by two or more wall sections 13, crownings 14, and partes basilaris ossis occipitalis 15. Furthermore, bending deformation of two or more wall sections 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many, and its effectiveness is large to reinforcement of the hollow panel 1.

[0028] Moreover, in the gestalt 1 of this operation, the reinforcement member 11 is formed with the synthetic-resin ingredient with which the fiber for strengthening was mixed, and since it becomes the firm structure which cannot deform the reinforcement member 11 much more easily, it becomes possible to reinforce the hollow panel 1 still more firmly. Moreover, the fizz base material 30 which the reinforcement member 11 carried out the both-ends approach location, and was formed between adjoining horizontal wall 12a, respectively foams by heat tracing, and serves as foam 35, and it pastes up that there is no clearance in the inner circle wall side of the hollow room 6. For this reason, it combines the hollow panel 1, an inner circle wall side, and the reinforcement member 11 in the shape of one, and by foam 35, it can intercept the hollow room 6 and it not only can heighten the reinforcement effectiveness, but can aim at improvement in the vibration-deadening nature of the hollow panel 1, or insulation.

[0029] In addition, in the gestalt 1 of said operation, although the case where it was arranged in the direction as for which two or more horizontal walls 12 carry out an abbreviation rectangular cross to the longitudinal direction of the hollow room 6 of the hollow panel 1 was illustrated, as shown in drawing 6 , even if it inclines suitably to the longitudinal direction of the hollow room 6 of the hollow panel 1 and arranges two or more horizontal walls 12, the operation effectiveness of an abbreviation EQC is acquired. Moreover, in the gestalt 1 of said operation, although the case where two or more horizontal walls 12 were connected with the longitudinal direction of the hollow room 6 of the hollow panel 1 by two or more wall sections 13 was illustrated, as shown in drawing 7 , two or more horizontal walls 12 may be connected with the longitudinal direction of the hollow room 6 of the hollow panel 1 by the one wall section 13, and the reinforcement member 11 may be constituted.

[0030] It will become lightweight while being able to reduce the synthetic-resin ingredient for fabricating the reinforcement member 11 by the space section between the adjoining horizontal walls 12, when the reinforcement member 11 is constituted, as shown in drawing 7 . Moreover, for example, when fabricating the reinforcement member 11 with injection molding, the reinforcement member 11 can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls 12 is prevented by the one wall section 13, a crowning 14, and the pars basilaris ossis occipitalis 15, and

bending deformation of the one wall section 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many.

[0031] (Gestalt 2 of operation) Next, the gestalt 2 of implementation of this invention is explained according to drawing 8 - drawing 12. In the gestalt 2 of this operation, the reinforcement member 11 consists of hard synthetic resin which has thermal resistance like the gestalt 1 of operation, and abbreviation, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. This reinforcement member 11 equips one with two or more wall sections 13 prolonged in the longitudinal direction of the hollow room 6 of the hollow panel 1, and two or more horizontal walls 12 which connect the wall section 13 of these plurality.

[0032] The other end side (it goes to drawing 10 and is the bottom) became large, and the wall section 13 which adjoins the wall section 13 located in a center section among two or more wall sections 13 of said reinforcement member 11 and its one side has countered in the shape of [ of abbreviation Ha ] a character while an end side (it goes to drawing 10 and is the bottom) is narrowly combined by the crowning 14. Moreover, while the wall section 13 which adjoins the wall section 13 located in said center section and its opposite side becomes large and an end side (it goes to drawing 10 and is the bottom) counters in the shape of [ of abbreviation reverse Ha ] a character, the other end side (it goes to drawing 10 and is the bottom) is narrowly combined by the pars basilaris ossis occipitalis 15. and into the part surrounded by said two or more horizontal walls 12 and two or more wall sections 13 The space section 16 which an end side (it goes to drawing 10 and is the bottom) is narrowly closed with a crowning 14, and an other end side (it goes to drawing 10 and is the bottom) becomes large, and carries out opening, An end side (it goes to drawing 10 and is the bottom) becomes large, opening is carried out, the space section 17 by which the other end side (it goes to drawing 10 and is the bottom) was narrowly closed with the pars basilaris ossis occipitalis 15 adjoins in the direction of a short hand of the hollow room 6 by turns, and partition formation is carried out. in addition, the opposite include angle of the adjoining wall section 13 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably.

[0033] Moreover, in the gestalt 2 of this operation, as shown in drawing 9, the attachment clip 50 which has structure in the inferior surface of tongue of the pars basilaris ossis occipitalis 15 located in the both-ends approach of the reinforcement member 11 like the gestalt 1 of operation and abbreviation is formed in the shape of one. In the gestalt 2 of this operation, as shown in drawing 9 and drawing 11 among two or more horizontal walls 12 of said reinforcement member 11, between horizontal wall 12a which is located in the both-ends approach of the reinforcement member 11, and adjoins, respectively, a crowning 14, a pars basilaris ossis occipitalis 15, and the wall section 13 of a center section are not formed, and, moreover, the height dimension of wall section 13a of the both-sides section is also low. And between the horizontal wall 12a concerned, the fizz base material 30 for foaming by heat tracing, becoming foam 35, and combining the inner circle wall side and the reinforcement member 11 of the hollow panel 1 in the shape of one, and intercepting the hollow room 6 is formed, respectively. Since the configuration of others of the gestalt 2 of this operation is constituted like the gestalt 1 of operation, and abbreviation, the same sign is written in addition to the same component, and that explanation is omitted.

[0034] Therefore, also in the gestalt 2 of this operation, the gestalt 1 of said operation and the same operation effectiveness as abbreviation are done so. That is, while the synthetic-resin ingredient for fabricating the reinforcement member 11 is reducible with the space sections 16 and 17, it will become lightweight, and since the opening side makes the shape of a large taper, moreover, each space sections 16 and 17 can unmold the reinforcement member 11 easily from a die. Moreover, bending deformation of two or more horizontal walls 12 is prevented by two or more wall sections 13, crownings 14, and partes basilaris ossis occipitalis 15. Furthermore, bending deformation of two or more wall sections 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many, and its effectiveness is large to reinforcement of the hollow panel 1. Moreover, by the foam



35 by heating foaming of the fizz base material 30 which the reinforcement member 11 carried out the both-ends approach location, and was formed between adjoining horizontal wall 12a, respectively, while being able to heighten the reinforcement effectiveness, the hollow room 6 can be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation can be aimed at. In addition, in the gestalt 2 of said operation, although the case where it was arranged in the direction as for which two or more horizontal walls 12 carry out an abbreviation rectangular cross to the longitudinal direction of the hollow room 6 was illustrated, even if it inclines suitably to the longitudinal direction of the hollow room 6 of the hollow panel 1 and arranges two or more horizontal walls 12, the operation effectiveness of an abbreviation EQC is acquired.

[0035] (Gestalt 3 of operation) The gestalt 3 of implementation of this invention is explained according to drawing 13 - drawing 16. In the gestalt 3 of this operation, a connection means constitutes another reinforcement member 11 possible [ connection to the longitudinal direction of the hollow room of a hollow panel ] at the gestalt 1 (or gestalt 2 of operation) of said operation, and the edge of the reinforcement member 11 with the same structure as abbreviation. As shown in drawing 13, the connection means was formed in the horizontal wall 12 located in the piece 60 of an elastic stop of the required number formed in the lateral surface of the horizontal wall 12 located in the end section of the reinforcement member 11, and the edge of another reinforcement member 11 which counters the horizontal wall 12 of the end section of the reinforcement member 11, and is equipped with the communicating pore 61 corresponding to the piece 60 of an elastic stop of a required number. And it is elastically engaged by the piece 60 of an elastic stop of the required number of the reinforcement member 11 being inserted in the communicating pore 61 of another reinforcement member 11 through the insertion hole installed by the fizz base material 30, and another reinforcement member 11 is connected in between with the edge of the reinforcement member 11 by this on both sides of the fizz base material 30.

[0036] Therefore, in the gestalt 3 of this operation, the reinforcement member 11 of the required number of the same structure is connected, or it becomes possible to constitute easily the reinforcement member which has different structure, for example, the die length which connects the reinforcement member 11 of the gestalt 1 of operation, and the reinforcement member 11 of the gestalt 2 of operation, and is considered as a request. Moreover, it also becomes possible to constitute the reinforcement member of the die length which connects the reinforcement member 11 of a simple substance with short length, and is considered as a request, and only the part which short-length-ized the reinforcement member 11 becomes easy [ manufacture, storage, conveyance, handling, etc. ].

[0037] In the gestalt 3 of said operation, the structure thing shown in drawing 14 - drawing 16 is employable as a connection means for connecting another reinforcement member 11 with the edge of the reinforcement member 11. That is, in the connection means shown in drawing 14, the connection sections 62 and 63 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. The piece 64 of engagement protrudes on one connection section 62 among both [ these ] the connection sections 62 and 63, and communicating pore 65 is formed in the connection section 63 of another side. And when connecting another reinforcement member 11 with the edge of the reinforcement member 11, another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the piece 64 of engagement of the connection section 62 of the reinforcement member 11 being inserted in the communicating pore 65 of the connection section 63 of another reinforcement member 11, and being engaged.

[0038] Moreover, in the connection means shown in drawing 15, the connection sections 66 and 67 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. Communicating pore is formed in these connection sections 66 and 67, respectively. And another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the connection section 66 of the reinforcement member 11 and the connection section 67 of another reinforcement member 11 piling up up and down, and a bolt 68 being inserted in over the communicating pore of both [ these ] the connection sections 66 and 67, and being bound tight with a nut 69. In addition, it can change to a bolt 68 and a nut 69, a connection clip can be inserted over the



communicating pore of both the connection sections 66 and 67, and another reinforcement member 11 can also be connected with the edge of the reinforcement member 11.

[0039] Moreover, in the connection means shown in drawing 16, the connection sections 70 and 71 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. And another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the connection section 70 of the reinforcement member 11 and the connection section 71 of another reinforcement member 11 piling up up and down, and both [ these ] the connection sections 70 and 71 being carried out adhesion 72 by adhesives, a binder, etc.

[0040] In the gestalten 1-3 of said operation, although it constituted so that the hollow room 6 might be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation might be aimed at by the foam 35 by heating foaming of the fizz base material 30, it is not necessary to necessarily intercept the hollow room 6. For example, by arranging the fizz base material 30 to the crowning 14 and pars basilaris ossis occipitalis 15 of the reinforcement member 11, and combining the inner circle wall side and the reinforcement member 11 of the hollow room 6 of the hollow panel 1 in the shape of one by the foam 35 by heating foaming of the fizz base material 30, it can fix firmly to the inside of the hollow room 6, without vibrating the reinforcement member 11, and effectiveness is large to reinforcement of the hollow panel 1.

[0041] (Gestalt 4 of operation) The gestalt 4 of implementation of this invention is explained according to drawing 17 - drawing 28. In the gestalt 4 of this operation, the reinforcement member 111 consists of hard synthetic resin which has thermal resistance like the gestalt 1 of operation or the gestalt 2 of operation, and abbreviation, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. This reinforcement member 111 equips one with two or more wall sections 113 prolonged in the longitudinal direction of the hollow room 6 of the hollow panel 1, and two or more horizontal walls 112 which connect the wall section 113 of these plurality.

[0042] As shown in drawing 17 - drawing 19, while outside wall section 113a which adjoins 2nd inside wall section 113b from the left toward predetermined, for example, drawing 18, on the outside becomes large and the bottom counters in the shape of [ of abbreviation reverse Ha ] a character, the bottom is narrowly combined by the pars basilaris ossis occipitalis 115 among two or more wall sections 113 of said reinforcement member 111. While the bottom is narrow and 2nd inside [ the right to ] wall section 113b is combined by the crowning 114 toward drawing 18 toward 2nd inside wall section 113b and drawing which adjoins the inside from the left, the bottom became large and has countered in the shape of [ of abbreviation Ha ] a character. Furthermore, while outside wall section 113a which adjoins 2nd inside wall section 113b from the right toward drawing 18 on the outside becomes large and the bottom counters in the shape of [ of abbreviation reverse Ha ] a character, the bottom is narrowly combined by the pars basilaris ossis occipitalis 115. And the space section 116 which the space section 117 which the bottom becomes large toward drawing 18 in the part surrounded by the wall section 113 of plurality [ wall / 112 / of said plurality / side ], carry out opening, and the bottom is narrow, and was taken up with the pars basilaris ossis occipitalis 115, and the bottom are narrow, and it is closed by the crowning 114, and the bottom becomes large, and carries out opening adjoins in the direction of the short hand of the hollow room 6 by turns, and partition formation is carried out. That is, the reinforcement member 111 of the gestalt 4 of this operation has at least four wall sections 113, and is making the shape of the cross section of about W characters. in addition, the opposite include angle of the adjoining wall section 113 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably.

[0043] As the gestalt 4 of this operation is especially shown in drawing 17 - drawing 19, the both ends of the longitudinal direction of both outsides wall section 113a located in both sides among the wall sections 113 of the plurality (four) of the reinforcement member 111 are really combined by the outside terminal wall 120 in the shape of continuation. And both [ these ] outsides wall section 113a and the outside peripheral wall section 122 which makes annular by both the outsides terminal wall 120 are constituted. Moreover, the both ends of the longitudinal direction of both inside wall section 113b which adjoins inside both outsides wall section 113a of the reinforcement member 111 are really combined by

the inside terminal wall 121 in the shape of continuation. And both [ these ] inside wall section 113b and the inside peripheral wall section 123 which makes annular by both the inside terminal wall 121 are constituted.

[0044] Moreover, as shown in drawing 20 and drawing 21 , while the bottom becomes large and the outside terminal wall 120 and the inside terminal wall 121 counter in the shape of [ of abbreviation reverse Ha ] a character toward drawing, the bottom is narrowly combined by pars-basilaris-ossis-occipitalis 115a. And space section 117a of the part concerned makes annular mostly with the space section 117 of said both sides, and the pars-basilaris-ossis-occipitalis 115a concerned is opening it for free passage while making the same side mostly with the pars basilaris ossis occipitalis 115 of said both sides and continuing. That is, between the outside peripheral wall section 122 and the inside peripheral wall section 123, the space section which makes annular mostly by the space sections 117 and 117a is constituted. Moreover, ranging over between outside wall section 113a which constitutes the outside peripheral wall section 122 as shown in drawing 18 , and outside horizontal wall 112a which constitutes the inside peripheral wall section 123, two or more outside horizontal wall 112a is prepared in one, and it is \*\*\*\*\*. Furthermore, as shown in drawing 19 , ranging over between both inside wall section 113b which constitutes the inside peripheral wall section 123, two or more inside horizontal wall 112b is prepared in one. And in the gestalt 4 of this operation, said outside horizontal wall 112a or inside horizontal wall 112b constitutes the horizontal wall 112. Moreover, the thick dimension of the horizontal wall 112 (outside horizontal wall 112a and inside horizontal wall 112b) is suitably set up small rather than the thick dimension of the wall section 113 (outside wall section 113a and inside wall section 113b), and reduction of an ingredient (synthetic-resin ingredient) is achieved.

[0045] Moreover, in the gestalt 4 of this operation, as shown in drawing 19 and drawing 23 , the attachment clip 150 as an attachment means to be inserted in the mounting hole 7 of the inner panel 2, and to engage with the inferior surface of tongue of pars-basilaris-ossis-occipitalis 115a located in the both-ends approach of the reinforcement member 111 elastically is really fabricated. This attachment clip 150 was constituted almost like the gestalt 1 of operation, and equips one with the seat 151, the leg 152, and the piece 153 of a stop of a pair. Moreover, the reinforcement member 111 is equipped with the fizz base materials 130-135 which combine the inner circle wall side and the reinforcement member 111 of the hollow panel 1 by foaming by heat tracing and becoming foam.

[0046] In the gestalt 4 of this operation, in order to equip with the fizz base materials 130 and 131 to the reinforcement member 111, as shown in drawing 18 and drawing 19 , crevices 124 and 125 are formed [ near the height direction both ends (vertical both ends) of the outside peripheral wall section 122 (outside wall section 113a and outside terminal wall 120) of the reinforcement member 111 ], respectively. Among said both crevices 124 and 125, the crevice 124 of the upper limit section of the outside peripheral wall section 122 is cut in the top face of the flange jutted out over the upper limit section periphery of the outside peripheral wall section 122 by making annular mostly, and is making annular mostly along with the flange. Moreover, as shown in drawing 18 and drawing 19 , the crevice 125 of the lower limit section of the outside peripheral wall section 122 is cut in the inferior surface of tongue of partes basilaris ossis occipitalis 115 and 115a, and is making annular mostly along with partes basilaris ossis occipitalis 115 and 115a. However, the crevice 125 has broken off in the part to the seat 151 of the attachment clip 150. Furthermore, the crevice 126 for holding the fizz base material 132 along with the longitudinal direction of the crowning 114 is cut also to the top face of the crowning 114 of the inside peripheral wall section 123.

[0047] Moreover, the reinforcement member 111 is equipped with the fizz base materials 133, 134, and 135 of the required number for collaborating with said each fizz base material 130, and intercepting the hollow room 6 while combining the inner circle wall side and the reinforcement member 111 of the hollow panel 1. In the gestalt 4 of this operation, in order to equip with said fizz base materials 133 and 134 While outside horizontal wall 112a which makes a pair, respectively, and inside horizontal wall 112b separate narrow spacing and are arranged in the both-ends approach of the longitudinal direction of the reinforcement member 111 The piece 160 of maintenance of the pair which makes the same side mostly with said outside horizontal wall 112a and inside horizontal wall 112b, and projects is formed in



the lateral surface of outside wall section 113a. And between these pairs each of an outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance, the fizz base material 136 is inserted, respectively and it is equipped with it.

[0048] As for said fizz base materials 130 and 136, it is desirable to be formed from the fizz ingredient which uses as a principal component the synthetic resin which has an adhesive property to a metal side or a synthetic-resin side like the fizz base material 30 of the gestalt 1 of operation, fibrous material for strengthening like a foaming agent and a glass fiber etc. is mixed by this, foams with the heat at the time of be the baking finish of the car body ( for example, temperature around 110 degrees C - 190 degrees C), and serves as foam of high rigidity. As a fizz ingredient which has such an adhesive property and serves as foam of high rigidity, it is indicated by JP,8-208871,A, JP,11-158313,A, etc., for example.

[0049] Moreover, the fizz base material 130 with which the crevices 124 and 125 near the height direction both ends of the outside peripheral wall section 122 of the reinforcement member 111 which make annular mostly, and the crevice 126 of the crowning 114 of the inside peripheral wall section 123 are equipped, respectively is easily formed, when what was formed in the shape of a long rod of extrusion molding is cut by predetermined die length. And the unit or two or more fizz base materials 130 of die length which are made necessary are pushed in to each crevices 124, 125, and 126, and it is equipped by pasting up with adhesives if needed. Moreover, it is bent and equipped with the fizz base material 130 to the corner section of crevices 124 and 125 which is making annular mostly.

[0050] Moreover, by injection molding, the fizz base materials 133, 134, and 135 with which it is equipped between a pair each outside horizontal wall 112a of the both-ends approach of the longitudinal direction of the reinforcement member 111, inside horizontal wall 112b, and the piece 160 of maintenance are formed in plate-like [ of the configuration made necessary ], and it is inserted and equipped with them between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance. And between a pair each outside horizontal wall 112a, inside horizontal

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wall 112b, and the piece 160 of maintenance, adhesives are used and the fizz base materials 133, 134, and 135 paste up so that each fizz base materials 133, 134, and 135 may not be omitted between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance.

Moreover, it may change to adhesives, the stop sections, such as a stop projection, may be prepared between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance, and each fizz base materials 133, 134, and 135 may be stopped.

[0051] said reinforcement implement 110 equipped with the reinforcement member 111 and the fizz base materials 130 and 136 as carried out should pass the almost same process as the gestalt 1 of operation -- it is equipped in the hollow room 6 of the hollow panel 1 (refer to drawing 20 - drawing 23 ). And as shown in drawing 24 , the reinforcement member 111 and the inner circle wall side of the hollow panel 1 are combined because each fizz base materials 130-135 foam, respectively and serve as foam 138 by heat tracing. By this, while reinforcing the hollow panel 1, the hollow room 6 is intercepted. Moreover, it is like the gestalt 1 of said operation, and abbreviation, and also in the gestalt 4 of this operation, while the synthetic-resin ingredient for fabricating the reinforcement member 111 is reducible with the space sections 116 and 117, it will become lightweight, and since that opening side makes the shape of a large taper, each space sections 116 and 117 can unmold the reinforcement member 111 easily from a die.

[0052] The outside peripheral wall section 122 in which it is really combined by the outside terminal wall 120 in the shape of continuation, and the both ends of the longitudinal direction of both outsides wall section 113a located in both sides among two or more wall sections 113 of the reinforcement member 111 make annular by it in the gestalt 4 of this operation especially is constituted. For this reason, it becomes the structure which cannot deform the reinforcement member 111 easily, and reinforcement reinforcement is raised by the outside peripheral wall section 122 which makes annular. Furthermore, the inside peripheral wall section 123 in which it is really combined by the inside terminal wall 121 in the shape of continuation, and the both ends of the longitudinal direction of both inside wall section 113b which adjoins inside both outsides wall section 113a of the reinforcement member 111 make annular by it is constituted. And the end of the outside peripheral wall section 122 and the inside



peripheral wall section 123 is combined with one by partes basilaris ossis occipitalis 115 and 115a, and the other end of the inside peripheral wall section 123 is combined with one by the crowning 114. For this reason, the reinforcement member 111 serves as structure which cannot deform much more easily, and reinforcement reinforcement is further raised to fitness.

[0053] Furthermore, [ near the both ends of the height direction of the outside peripheral wall section 122 ], the fizz base materials 130 and 131 of the crevices 124 and 125 which make annular mostly along a perimeter in the outside peripheral wall section 122 foam, respectively, serve as foam 138, and can combine the perimeter of the both ends of the height direction of the outside peripheral wall section 122 of the reinforcement member 111, and the inner circle wall side of the hollow panel 1. Furthermore, the fizz base material 130 of the crevice 125 of the crowning 114 of the inside peripheral wall section 123 foams, it becomes foam 138, and the crowning 114 of the reinforcement member 111 and the inner circle wall side of the hollow panel 1 can be combined. For this reason, in the reinforcement member 111, it can respond to the load which acts on the hollow panel 1 through each foam 138, and effectiveness is large to reinforcement of the hollow panel 1. Moreover, in the both-ends approach of the longitudinal direction of the reinforcement member 111, the fizz base materials 133, 134, and 135 with which it was equipped, respectively between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance can foam, respectively, can serve as foam 138, can combine the reinforcement member 111 and the wall peripheral surface of the hollow panel 1, and can intercept the hollow room 6. For this reason, while being able to heighten the reinforcement effectiveness further, the hollow room 6 can be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation can be aimed at.

[0054] In the gestalt 4 of said operation, in case each fizz base materials 130-135 foam, respectively, according to the field where each crevices 124, 125, and 126 face, and the field where outside horizontal wall 112a of a pair, inside horizontal wall 112b, and the piece 160 of maintenance face, it is regulated that each fizz base materials 130-135 foam to the longitudinal direction of the hollow room 6, and it foams towards the inner circle wall side of the hollow panel 1. For this reason, the foam 138 by foaming of each fizz base materials 130-135 pastes up that there is no clearance in the inner circle wall side of the hollow panel 1. Consequently, the fault (for example, poor noise insulation) by generating of a clearance can be prevented.

[0055] In addition, in the gestalt 4 of said operation, as shown in drawing 25 and drawing 26, you may change. That is, as shown in drawing 25, the tabular fizz base materials 136 and 137 are stuck by adhesives to the lateral surface of the outside peripheral wall section 122 of the reinforcement member 111. And the inner circle wall side and the reinforcement member 111 of the hollow room 6 of the hollow panel 1 are combined in the shape of one by the foam 136a and 137a by foaming of these fizz base materials 136 and 137. Therefore, by combining the inner circle wall side and the reinforcement member 111 of the hollow room 6 of the hollow panel 1 in the shape of one by the foam 136a and 137a by foaming of the fizz base materials 136 and 137, without vibrating the reinforcement member 111, it can join together to the inside of the hollow room 6, and effectiveness is large to reinforcement of the hollow panel 1. Moreover, it is also possible to constitute the reinforcement member 111 stated with the gestalt 4 of said operation possible [ connection to the longitudinal direction of the hollow room of a hollow panel ] with the connection means stated with the gestalt 3 of operation.

[0056] Moreover, when it crosses in the shape of T character to the upper part of the hollow panel 1 which constitutes a center pillar and the roof side panel (it is also called a roof side rail) is continuing as it is indicated in drawing 28 as drawing 27 for example, it is also possible to form at one the extension prolonged in the hollow room of a roof side panel in the upper part of the reinforcement member 111 which interior is carried out to the hollow panel 1, and reinforces it, and to reinforce a T character-like intersection. In this case, as shown in drawing 28, the extension of the right and left mostly prolonged in the shape of level towards the hollow room of a roof side panel is formed in the upper outside terminal wall 120, respectively among both the outsides terminal walls 120 that have combined the both ends of the longitudinal direction of both outsides wall section 113a of the reinforcement member 111. Furthermore, both the extensions of the right and left mostly prolonged in the shape of level along with

the inside of both the extensions of said outside terminal wall 120 are formed in the upper inside terminal wall 121, respectively among both the inside terminal walls 121 that have combined the both ends of the longitudinal direction of both inside wall section 113b of the reinforcement member 111. Thus, in the upper limit section of the reinforcement member 111, the intersection of the shape of T character of a center pillar and a roof side panel can be reinforced by forming an extension in upper outside terminal wall 120a and upper inside terminal wall 121a, respectively.

[0057] In addition, this invention is not limited to the gestalten 1-4 of said operation. For example, although the case where the reinforcement implement 10 (or 110) was constituted by the combination of the reinforcement member 11 (or 111) and the fizz base material 30 (or 130-137) was illustrated in the gestalten 1-4 of said operation It is not necessary to surely use the fizz base material 30 (or 130-137), and it may constitute the reinforcement implement 10 (or 110) only by the reinforcement member 11 (or 111). Moreover, it may change to the attachment clip 50 (or 150) as an attachment means for equipping with the reinforcement member 11 (or 111) to the hollow panel 1, a bolt, a nut, etc. can also be used, and the attachment clip of another object may be further used in the reinforcement member 11 (or 111). Moreover, although the case where the hollow structures were the hollow panels 1, such as a pillar of the car body, a rocker panel, and a roof panel, was illustrated, the hollow structure may be the hollow structure which constitutes buildings, such as a building except the car body, and a vessel.

[0058]

[Effect of the Invention] According to this invention, as stated above, the amount of the ingredient used required in order to form a reinforcement member, for example, a synthetic-resin ingredient, can be mitigated, and it can reduce the cost of materials, and only that part can constitute a firm lightweight and reinforcement member, and it not only can offer a reinforcement member cheaply, but can reinforce the hollow structure efficiently by that reinforcement member.

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[Translation done.]

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**TECHNICAL FIELD**

**[Field of the Invention] This invention relates to the reinforcement implement of the hollow structure for reinforcing the hollow panels (for example, the center pillar of the car body, a front pillar, a quota pillar, a roof side panel, a rocker panel, etc.) constituted by the cube type closing cross section in the air mainly by two or more panels about the reinforcement implement of the hollow structure.**

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**PRIOR ART**

[Description of the Prior Art] It was common to have installed the metal RINHOSUMENTO panel inside between the inner panels and outer panels which constitute a hollow panel, and to have reinforced the hollow panel as a reinforcement structure of the hollow panel of the car body, conventionally. However, if a hollow panel is reinforced by the metal RINHOSUMENTO panel, the weight of a hollow panel will increase sharply and will have a bad influence on fuel consumption etc. Since it is such, in order to suppress the increment in weight of a hollow panel and to reinforce a hollow panel, as shown in drawing 29, installing the reinforcement member 211 made of synthetic resin inside the hollow room of a hollow panel, and reinforcing a hollow panel is known. That is, the reinforcement member 211 made of synthetic resin is equipped with the piece 213 of connection which maintains predetermined spacing and connects with one two or more reinforcement plates 212 which intersect perpendicularly with the longitudinal direction of a hollow room, respectively, and two or more of these reinforcement plates 212.

[0003] Moreover, between the reinforcement plate 212 of both ends, and the reinforcement plate 212 which adjoins these reinforcement plate 212, respectively, the fizz base material 230 is inserted and held among two or more reinforcement plates 212 of the reinforcement member 211. And the periphery section of the foam pastes the inner skin of a hollow panel by the fizz base material 230 foaming and becoming foam by heat tracing. As a reinforcement implement of the hollow structure with such structure, it is indicated by JP,10-53156,A, for example.

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**EFFECT OF THE INVENTION**

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**[Effect of the Invention] According to this invention, as stated above, the amount of the ingredient used required in order to form a reinforcement member, for example, a synthetic-resin ingredient, can be mitigated, and it can reduce the cost of materials, and only that part can constitute a firm lightweight and reinforcement member, and it not only can offer a reinforcement member cheaply, but can reinforce the hollow structure efficiently by that reinforcement member.**

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] By the way, in the reinforcement implement of said conventional hollow structure, the reinforcement member 211 constituted by the piece 213 of connection which maintains two or more reinforcement plates 212 which intersect perpendicularly with the longitudinal direction of a hollow room, respectively, and two or more of these reinforcement plates 212, and connects predetermined spacing serves as structure which it bends and is easy to deform in the piece 213 of connection. For this reason, there was a trouble that reinforcement of the hollow structure became weak to the direction where the piece 213 of connection bends. Moreover, if the spacing dimension of the reinforcement plate 212 is made small and only the part shortens the piece 213 of connection, the piece 213 of connection will stop being able to bend easily. However, if the spacing dimension of the reinforcement plate 212 is made small and the number of sheets of the reinforcement plate 212 is increased, a lot of synthetic-resin ingredients will be needed, and it will become cost quantity. Furthermore, if the spacing dimension of the reinforcement plate 212 is made small, it may become difficult from a die to unmold a reinforcement member.

[0005] The purpose of this invention is offering the reinforcement implement of the hollow structure with which a firm lightweight and reinforcement member's can be constituted and the hollow structure's can be efficiently reinforced by that reinforcement member in view of said conventional trouble.

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[Translation done.]



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**MEANS**

[Means for Solving the Problem] In order to attain said purpose, the reinforcement implement of the hollow structure concerning the 1st invention makes a summary the configuration of a passage according to claim 1. Therefore, according to the 1st invention, two or more horizontal walls of a reinforcement member are combined by a crowning and the pars basilaris ossis occipitalis, respectively, the shape of one is connected with a longitudinal direction by the wall section in nothing and the horizontal wall of these plurality, and the reinforcement member is constituted. Thus, the constituted reinforcement member will become lightweight while being able to reduce by the space section between adjoining horizontal walls, the ingredient, for example, the synthetic-resin ingredient, for forming this reinforcement member. Moreover, for example, when forming a reinforcement member with injection molding, a reinforcement member can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls is prevented by the wall section, a crowning, and the pars basilaris ossis occipitalis, and bending deformation of the wall section is prevented by two or more horizontal walls, crownings, and partes basilaris ossis occipitalis. For this reason, a reinforcement member serves as structure which cannot deform easily to the load from many.

[0007] Moreover, the reinforcement implement of the hollow structure concerning the 2nd invention makes a summary the configuration of a passage according to claim 2. The reinforcement implement of the hollow structure concerning the 3rd invention makes a summary the configuration of a passage according to claim 3. Therefore, the end section is closed with a crowning by the part which was surrounded by two or more horizontal walls of a reinforcement member, and two or more wall sections according to the 2nd and 3rd invention, and the reinforcement member is constituted from partition formation of the space section which the other end becomes large and carries out opening, and the space section which the end section becomes large and carries out opening and by which the other end was plugged up with the pars basilaris ossis occipitalis being carried out, respectively. Thus, the constituted reinforcement member will become lightweight while being able to reduce by the space section by which partition formation was carried out, the ingredient, for example, the synthetic-resin ingredient, for forming this reinforcement member. Moreover, for example, when forming a reinforcement member with injection molding, a reinforcement member can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls is prevented by two or more wall sections, crownings, and partes basilaris ossis occipitalis, and bending deformation of two or more wall sections is prevented by two or more horizontal walls, crownings, and partes basilaris ossis occipitalis. For this reason, a reinforcement member serves as structure which cannot deform easily to the load from many.

[0008] Moreover, for the both ends of the longitudinal direction of both the outsides wall section that the reinforcement implement of the hollow structure concerning the 4th invention makes a summary the configuration of a passage according to claim 4, and is located in the both-sides section among two or more wall sections of a reinforcement member, the outside peripheral wall section which is combined with one by the outside terminal wall and makes annular by said both outsides wall section and said both outsides terminal wall is configuration \*\*\*\*\*. Thus, by constituting the outside peripheral wall section in which it is combined with one by the outside terminal wall, and both the outsides wall section of a

reinforcement member makes annular by it, it becomes the structure which cannot deform a reinforcement member easily, and reinforcement reinforcement is raised.

[0009] Moreover, the reinforcement implement of the hollow structure concerning the 5th invention Make the configuration of a passage according to claim 5 into a summary, and the both ends of the longitudinal direction of both the inside wall section that adjoins inside both the outsides wall section of a reinforcement member are combined with one by the inside terminal wall. The inside peripheral wall section which makes annular along with the inner circumference of the outside peripheral wall section by said both inside wall section and said both inside terminal wall is configuration \*\*\*\*\*. Thus, by constituting the outside peripheral wall section in which it is combined with one by the outside terminal wall, and both the outsides wall section of a reinforcement member makes annular by it, and both the inside wall section of this reinforcement member being combined with one by the inside terminal wall, and constituting the inside peripheral wall section, a reinforcement member serves as structure which cannot deform much more easily, and reinforcement reinforcement is further raised to fitness.

[0010] Moreover, the reinforcement implement of the hollow structure concerning the 6th invention makes a summary the configuration of a passage according to claim 6, and the inside terminal wall which makes the outside terminal wall which makes the end section of the outside peripheral wall section of a reinforcement member, and the end section of the inside peripheral wall section has the extension prolonged towards another hollow room which makes the shape of about T characters at the end of a hollow room, and is open for free passage at it, respectively. Therefore, also in the part concerned, it can reinforce by extending towards another hollow room which each extension of the outside terminal wall which makes the end section of the outside peripheral wall section of a reinforcement member, and the inside terminal wall which makes the end section of the inside peripheral wall section makes the shape of about T characters at the end of a hollow room, and opens for free passage at it. For example, also in the intersection of the shape of T character of the center pillar of a car, and a roof side panel (it is also called a roof side rail) etc., it can reinforce good.

[0011] Moreover, the reinforcement implement of the hollow structure concerning the 7th invention makes a summary the configuration of a passage according to claim 7, and the outside horizontal wall is prepared in one ranging over between the outside wall section of the outside peripheral wall section, and the inside wall sections of the inside peripheral wall section. Moreover, the reinforcement implement of the hollow structure concerning the 8th invention makes a summary the configuration of a passage according to claim 8, and the inside horizontal wall is prepared in one ranging over between both the inside wall sections of the inside peripheral wall section.

[0012] Moreover, the reinforcement implement of the hollow structure concerning the 9th invention is that a reinforcement member is formed with the synthetic-resin ingredient with which the configuration of a passage according to claim 9 is made into a summary, and \*\* and the fiber for strengthening were mixed, and serves as firm structure which cannot deform a reinforcement member much more easily.

[0013] Moreover, the reinforcement implement of the hollow structure concerning the 10th invention Since the configuration of a passage according to claim 10 is made into a summary, and a fizz base material foams by heat tracing, it becomes foam and the inner circle wall side and reinforcement member of a hollow room are combined by the foam in the shape of one, It can fix firmly, without vibrating a reinforcement member in the clearance between the inner circle wall side of a hollow room, and a reinforcement member, and effectiveness is large to reinforcement of the hollow structure.

[0014] Moreover, since the reinforcement implement of the hollow structure concerning the 11th invention makes a summary the configuration of a passage according to claim 11, and a fizz base material foams to it by \*\* and heat tracing, it serves as foam and a hollow room can be intercepted by the foam, improvement in the vibration-deadening nature of the hollow structure or insulation can be aimed at.

[0015] Moreover, the reinforcement implement of the hollow structure concerning the 12th invention makes a summary the configuration of a passage according to claim 12, and [ near the both ends of the height direction of the outside peripheral wall section of a reinforcement member ], it is becoming foam by heat tracing, and is equipped with the fizz base material which combines the inner circle wall side



and said reinforcement member of a hollow room of said hollow structure. Therefore, the fizz base material near the both ends of the height direction of the outside peripheral wall section foams, respectively, serves as foam, and can combine the perimeter of the both ends of the height direction of the outside peripheral wall section of a reinforcement member, and the inner circle wall side of the hollow structure. For this reason, in a reinforcement member, it can respond to the load which acts on the hollow structure through each foam, and effectiveness is large to reinforcement of the hollow structure.

[0016] Moreover, the reinforcement implement of the hollow structure concerning the 13th invention makes a summary the configuration of a passage according to claim 13, and the crevice for holding a fizz base material is prepared almost annularly along with this outside peripheral wall section near the both ends of the height direction of the outside peripheral wall section of a reinforcement member. Therefore, in case each fizz base material foams, the foaming direction of each fizz base material is regulated by the medial surface of each crevice, and it becomes possible to make each [ these ] fizz base material turn and foam to the inner circle wall side of the hollow structure. For this reason, the foam by foaming of each fizz base material can paste up that there is no clearance in the inner circle wall side of the hollow structure, and can combine certainly the inner circle wall side and reinforcement member of the hollow structure by this.

[0017] Moreover, the reinforcement implement of the hollow structure concerning the 14th invention can make a summary the configuration of a passage according to claim 14, and can reinforce the hollow structure with another reinforcement member being connected with the edge of a reinforcement member by the connection means easily covering the die length considered as a request. Moreover, it becomes possible to form the reinforcement member of a simple substance in short length, and only the part which short-length-ized the reinforcement member becomes easy [ manufacture, storage, conveyance, handling, etc. ].

[0018]

[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt 1 of implementation of this invention is explained according to drawing 1 - drawing 5. In drawing 2 and drawing 3, the hollow panel (for example, center pillar) 1 is that SUPPOTO welding of the inner panel 2 and the outer panel 4 is carried out by the mutual flanges 3 and 5, and is constituted by the cube type closing cross section in the air. The mounting hole 7 is formed in the predetermined location of the vertical section at the inner panel 2. In the hollow room 6, it is equipped with the reinforcement implement 10 and said hollow panel 1 is reinforced.

[0019] As shown in drawing 1 and drawing 2, said reinforcement implement 10 is equipped with the reinforcement member 11 with which has the die-length dimension made necessary at the longitudinal direction of the hollow room 6 of the hollow panel 1, and it is equipped in the hollow room 6 by the attachment means and which reinforces the hollow panel 1, and the fizz base material 30 arranged in the predetermined location of the reinforcement member 11. Said reinforcement member 11 equips one with two or more horizontal walls 12 arranged by separating spacing which has a predetermined clearance between the inner circle wall sides of the hollow room 6 of the hollow panel 1, and is made necessary at the longitudinal direction of the hollow room 6, and two or more wall sections 13 which connect the horizontal wall 12 of these plurality. Moreover, said reinforcement member 11 consists of hard synthetic resin which has thermal resistance, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. As a hard synthetic-resin ingredient, PA (polyamide), PBT (polybutylene terephthalate), PET (polyethylene terephthalate), PP (polypropylene), PPS (polyphenylene sulfide), etc. are used, for example. Moreover, as fiber for strengthening, a glass fiber, carbon fiber, Kevlar fiber, etc. are used, for example. Furthermore, the mixing rate of strengthening fiber to a hard synthetic-resin ingredient is desirably set as 30 - 40% of the weight of a mixing rate five to 65% of the weight.

[0020] The other end side (it goes to drawing 2 and is the bottom) became large, and the horizontal wall 12 which adjoins the predetermined horizontal wall 12 and its one side among two or more horizontal walls 12 of said reinforcement member 11 has countered in the shape of [ of abbreviation Ha ] a



character while an end side (it goes to drawing 2 and is the bottom) is narrowly combined by the crowning 14. Moreover, while the horizontal wall 12 which adjoins said predetermined horizontal wall 12 and its opposite side becomes large and an end side (it goes to drawing 2 and is the bottom) counters in the shape of [ of abbreviation reverse Ha ] a character, the other end side (it goes to drawing 2 and is the bottom) is narrowly combined by the pars basilaris ossis occipitalis 15. and into the part surrounded by said two or more horizontal walls 12 and two or more wall sections 13 The space section 16 which an end side (it goes to drawing 2 and is the bottom) is narrowly closed with a crowning 14, and an other end side (it goes to drawing 2 and is the bottom) becomes large, and carries out opening, An end side (it goes to drawing 2 and is the bottom) becomes large, opening is carried out, the space section 17 by which the other end side (it goes to drawing 2 and is the bottom) was narrowly closed with the pars basilaris ossis occipitalis 15 adjoins the longitudinal direction of the hollow room 6 by turns, and partition formation is carried out. moreover, the opposite include angle of said adjoining horizontal wall 12 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably. If the opposite include angle of the adjoining horizontal wall 12 turns into 5 or less times, it may become difficult to unmold the reinforcement member 11 from the die for injection molding. Moreover, if the opposite include angle of the adjoining horizontal wall 12 becomes large at 60 degrees or more, the number of arrangement of the horizontal wall [ / in the die length made necessary ] 12 decreases, and the firm reinforcement member 11 may be unable to be fabricated. However, horizontal wall 12a of a part in which the fizz base material 30 explained in full detail behind is arranged is making the letter of abbreviation parallel.

[0021] Moreover, in the gestalt 1 of this operation, as shown in drawing 2 , the attachment clip 50 as an attachment means to be inserted in the mounting hole 7 of the inner panel 2, and to engage with the inferior surface of tongue of the pars basilaris ossis occipitalis 15 located in the both-ends approach of the reinforcement member 11 elastically is formed in the shape of one. This attachment clip 50 is

equipped with the piece 53 of a stop of the pair which extends in the shape of a cuff and engages with a mounting hole 7 elastically from the tip of the seat 51 prepared in the pars basilaris ossis occipitalis 15, the leg 52 which is projected from that seat 51 and inserted in a mounting hole 7, and its leg 52.

[0022] Moreover, in the gestalt 1 of this operation, horizontal wall 12a which is located in the both-ends approach of the reinforcement member 11 among two or more horizontal walls 12 of said reinforcement member 11, and adjoins, respectively made the letter of abbreviation parallel, and has countered.

Furthermore, between horizontal wall 12a which these-adjoins, a crowning 14 or a pars basilaris ossis occipitalis 15 is not formed, and, moreover, the height dimension of wall section 13a is also low. And between the horizontal wall 12a concerned, the fizz base material 30 for foaming by heat tracing, becoming foam 35, and combining the inner circle wall side and the reinforcement member 11 of the hollow panel 1 in the shape of one, and intercepting the hollow room 6 is formed, respectively.

[0023] Said fizz base material 30 is formed in the configuration which consists of a fizz ingredient of the synthetic-resin system of foaming agent mixing to which it foams by heat tracing, and is made necessary with injection molding etc. And the groove cut section 31 inserted in wall section 13a is formed in the predetermined location of the fizz base material 30. Moreover, as for the fizz base material 30, it is desirable to be formed from the fizz ingredient which uses as a principal component the synthetic resin which has an adhesive property to a metal side or a synthetic-resin side, fibrous material for strengthening like a foaming agent and a glass fiber etc. is mixed by this, foams with the heat at the time of being the baking finish of the car body (for example, temperature around 110 degrees C - 190 degrees C), and serves as foam of high rigidity. As a fizz ingredient which has such an adhesive property and serves as foam of high rigidity, it is indicated by JP,8-208871,A, JP,11-158313,A, etc., for example.

[0024] It intercepts the hollow room 6 while it is equipped with it in the hollow room 6 of the hollow panel 1 as the reinforcement implement 10 equipped with the reinforcement member 11 and the fizz base material 30 as described above is described below, and it reinforces the hollow panel 1. That is, before carrying out spot welding of the inner panel 2 and the outer panel 4 which constitute the hollow panel 1 in the mutual flanges 3 and 5 first when equipping with the reinforcement implement 10 to the hollow room 6 of the hollow panel 1 as shown in drawing 2 and drawing 3 , in the attachment clip 50 of

the reinforcement member 11, it is equipped with the reinforcement implement 10 to the mounting hole 7 of the inner panel 2. Then, in the mutual flanges 3 and 5, spot welding of the inner panel 2 and the outer panel 4 is carried out, and the hollow panel 1 which makes a cube type closing cross section in the air is constituted.

[0025] Here, the fizz base material 30 of the both-ends approach of the reinforcement member 11 foams, respectively, and serves as foam 35 with heating from the outside, for example, the heat tracing in the case of the baking finish of the car body which has said hollow panel 1, (refer to drawing 5). In case the fizz base material 30 foams, the both-sides side of the fizz base material 30 is supported by adjoining horizontal wall 12a, respectively. for this reason, the direction which foaming of the fizz base material 30 to the longitudinal direction of the hollow room 6 is restricted, and intersects perpendicularly with a longitudinal direction -- receiving -- foaming is promoted. And the foam 35 by foaming of the fizz base material 30 pastes each that there is no clearance in the inner circle wall side of the hollow room 6. While the hollow panel 1, an inner circle wall side, and the reinforcement member 11 are combined in the shape of one by this and the hollow panel 1 is reinforced, the hollow room 6 is intercepted.

[0026] In the reinforcement member 11 made of synthetic resin which makes the body part of said reinforcement implement 10, into the part surrounded by two or more of the horizontal walls 12 and two or more wall sections 13 The end section is closed by the crowning 14 and it consists of that the space section 16 which the other end becomes large and carries out opening, and the space section 17 which the end section becomes large and carries out opening and by which the other end was plugged up with the pars basilaris ossis occipitalis 15 adjoin the longitudinal direction of the hollow room 6 by turns, and partition formation is carried out. Thus, the constituted reinforcement member 11 will become lightweight while being able to reduce the synthetic-resin ingredient for fabricating this reinforcement member 11 by the space sections 16 and 17 by which adjoined the longitudinal direction of the hollow room 6 by turns, and partition formation was carried out.

[0027] Moreover, when fabricating the reinforcement member 11 with injection molding, since the opening side makes the shape of a large taper, each space sections 16 and 17 can unmold the reinforcement member 11 easily from the die for injection molding. Moreover, bending deformation of two or more horizontal walls 12 is prevented by two or more wall sections 13, crownings 14, and partes basilaris ossis occipitalis 15. Furthermore, bending deformation of two or more wall sections 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many, and its effectiveness is large to reinforcement of the hollow panel 1.

[0028] Moreover, in the gestalt 1 of this operation, the reinforcement member 11 is formed with the synthetic-resin ingredient with which the fiber for strengthening was mixed, and since it becomes the firm structure which cannot deform the reinforcement member 11 much more easily, it becomes possible to reinforce the hollow panel 1 still more firmly. Moreover, the fizz base material 30 which the reinforcement member 11 carried out the both-ends approach location, and was formed between adjoining horizontal wall 12a, respectively foams by heat tracing, and serves as foam 35, and it pastes up that there is no clearance in the inner circle wall side of the hollow room 6. For this reason, it combines the hollow panel 1, an inner circle wall side, and the reinforcement member 11 in the shape of one, and by foam 35, it can intercept the hollow room 6 and it not only can heighten the reinforcement effectiveness, but can aim at improvement in the vibration-deadening nature of the hollow panel 1, or insulation.

[0029] In addition, in the gestalt 1 of said operation, although the case where it was arranged in the direction as for which two or more horizontal walls 12 carry out an abbreviation rectangular cross to the longitudinal direction of the hollow room 6 of the hollow panel 1 was illustrated, as shown in drawing 6, even if it inclines suitably to the longitudinal direction of the hollow room 6 of the hollow panel 1 and arranges two or more horizontal walls 12, the operation effectiveness of an abbreviation EQC is acquired. Moreover, in the gestalt 1 of said operation, although the case where two or more horizontal walls 12 were connected with the longitudinal direction of the hollow room 6 of the hollow panel 1 by two or more wall sections 13 was illustrated, as shown in drawing 7, two or more horizontal walls 12



may be connected with the longitudinal direction of the hollow room 6 of the hollow panel 1 by the one wall section 13, and the reinforcement member 11 may be constituted.

[0030] It will become lightweight while being able to reduce the synthetic-resin ingredient for fabricating the reinforcement member 11 by the space section between the adjoining horizontal walls 12, when the reinforcement member 11 is constituted, as shown in drawing 7. Moreover, for example, when fabricating the reinforcement member 11 with injection molding, the reinforcement member 11 can be easily unmolded from the die. Moreover, bending deformation of two or more horizontal walls 12 is prevented by the one wall section 13, a crowning 14, and the pars basilaris ossis occipitalis 15, and bending deformation of the one wall section 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many.

[0031] (Gestalt 2 of operation) Next, the gestalt 2 of implementation of this invention is explained according to drawing 8 - drawing 12. In the gestalt 2 of this operation, the reinforcement member 11 consists of hard synthetic resin which has thermal resistance like the gestalt 1 of operation, and abbreviation, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. This reinforcement member 11 equips one with two or more wall sections 13 prolonged in the longitudinal direction of the hollow room 6 of the hollow panel 1, and two or more horizontal walls 12 which connect the wall section 13 of these plurality.

[0032] The other end side (it goes to drawing 10 and is the bottom) became large, and the wall section 13 which adjoins the wall section 13 located in a center section among two or more wall sections 13 of said reinforcement member 11 and its one side has countered in the shape of [ of abbreviation Ha ] a character while an end side (it goes to drawing 10 and is the bottom) is narrowly combined by the crowning 14. Moreover, while the wall section 13 which adjoins the wall section 13 located in said center section and its opposite side becomes large and an end side (it goes to drawing 10 and is the bottom) counters in the shape of [ of abbreviation reverse Ha ] a character, the other end side (it goes to drawing 10 and is the bottom) is narrowly combined by the pars basilaris ossis occipitalis 15. and into the part surrounded by said two or more horizontal walls 12 and two or more wall sections 13 The space section 16 which an end side (it goes to drawing 10 and is the bottom) is narrowly closed with a crowning 14, and an other end side (it goes to drawing 10 and is the bottom) becomes large, and carries out opening, An end side (it goes to drawing 10 and is the bottom) becomes large, opening is carried out, the space section 17 by which the other end side (it goes to drawing 10 and is the bottom) was narrowly closed with the pars basilaris ossis occipitalis 15 adjoins in the direction of a short hand of the hollow room 6 by turns, and partition formation is carried out. in addition, the opposite include angle of the adjoining wall section 13 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably.

[0033] Moreover, in the gestalt 2 of this operation, as shown in drawing 9, the attachment clip 50 which has structure in the inferior surface of tongue of the pars basilaris ossis occipitalis 15 located in the both-ends approach of the reinforcement member 11 like the gestalt 1 of operation and abbreviation is formed in the shape of one. In the gestalt 2 of this operation, as shown in drawing 9 and drawing 11 among two or more horizontal walls 12 of said reinforcement member 11, between horizontal wall 12a which is located in the both-ends approach of the reinforcement member 11, and adjoins, respectively, a crowning 14, a pars basilaris ossis occipitalis 15, and the wall section 13 of a center section are not formed, and, moreover, the height dimension of wall section 13a of the both-sides section is also low. And between the horizontal wall 12a concerned, the fizz base material 30 for foaming by heat tracing, becoming foam 35, and combining the inner circle wall side and the reinforcement member 11 of the hollow panel 1 in the shape of one, and intercepting the hollow room 6 is formed, respectively. Since the configuration of others of the gestalt 2 of this operation is constituted like the gestalt 1 of operation, and abbreviation, the same sign is written in addition to the same component, and that explanation is omitted.

[0034] Therefore, also in the gestalt 2 of this operation, the gestalt 1 of said operation and the same operation effectiveness as abbreviation are done so. That is, while the synthetic-resin ingredient for



fabricating the reinforcement member 11 is reducible with the space sections 16 and 17, it will become lightweight, and since the opening side makes the shape of a large taper, moreover, each space sections 16 and 17 can unmold the reinforcement member 11 easily from a die. Moreover, bending deformation of two or more horizontal walls 12 is prevented by two or more wall sections 13, crownings 14, and partes basilaris ossis occipitalis 15. Furthermore, bending deformation of two or more wall sections 13 is prevented by two or more horizontal walls 12, crownings 14, and partes basilaris ossis occipitalis 15. For this reason, the reinforcement member 11 serves as structure which cannot deform easily to the load from many, and its effectiveness is large to reinforcement of the hollow panel 1. Moreover, by the foam 35 by heating foaming of the fizz base material 30 which the reinforcement member 11 carried out the both-ends approach location, and was formed between adjoining horizontal wall 12a, respectively, while being able to heighten the reinforcement effectiveness, the hollow room 6 can be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation can be aimed at. In addition, in the gestalt 2 of said operation, although the case where it was arranged in the direction as for which two or more horizontal walls 12 carry out an abbreviation rectangular cross to the longitudinal direction of the hollow room 6 was illustrated, even if it inclines suitably to the longitudinal direction of the hollow room 6 of the hollow panel 1 and arranges two or more horizontal walls 12, the operation effectiveness of an abbreviation EQC is acquired.

[0035] (Gestalt 3 of operation) The gestalt 3 of implementation of this invention is explained according to drawing 13 - drawing 16. In the gestalt 3 of this operation, a connection means constitutes another reinforcement member 11 possible [ connection to the longitudinal direction of the hollow room of a hollow panel ] at the gestalt 1 (or gestalt 2 of operation) of said operation, and the edge of the reinforcement member 11 with the same structure as abbreviation. As shown in drawing 13, the connection means was formed in the horizontal wall 12 located in the piece 60 of an elastic stop of the required number formed in the lateral surface of the horizontal wall 12 located in the end section of the reinforcement member 11, and the edge of another reinforcement member 11 which counters the horizontal wall 12 of the end section of the reinforcement member 11, and is equipped with the communicating pore 61 corresponding to the piece 60 of an elastic stop of a required number. And it is elastically engaged by the piece 60 of an elastic stop of the required number of the reinforcement member 11 being inserted in the communicating pore 61 of another reinforcement member 11 through the insertion hole installed by the fizz base material 30, and another reinforcement member 11 is connected in between with the edge of the reinforcement member 11 by this on both sides of the fizz base material 30.

[0036] Therefore, in the gestalt 3 of this operation, the reinforcement member 11 of the required number of the same structure is connected, or it becomes possible to constitute easily the reinforcement member which has different structure, for example, the die length which connects the reinforcement member 11 of the gestalt 1 of operation, and the reinforcement member 11 of the gestalt 2 of operation, and is considered as a request. Moreover, it also becomes possible to constitute the reinforcement member of the die length which connects the reinforcement member 11 of a simple substance with short length, and is considered as a request, and only the part which short-length-ized the reinforcement member 11 becomes easy [ manufacture, storage, conveyance, handling, etc. ].

[0037] In the gestalt 3 of said operation, the structure thing shown in drawing 14 - drawing 16 is employable as a connection means for connecting another reinforcement member 11 with the edge of the reinforcement member 11. That is, in the connection means shown in drawing 14, the connection sections 62 and 63 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. The piece 64 of engagement protrudes on one connection section 62 among both [ these ] the connection sections 62 and 63, and communicating pore 65 is formed in the connection section 63 of another side. And when connecting another reinforcement member 11 with the edge of the reinforcement member 11, another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the piece 64 of engagement of the connection section 62 of the reinforcement member 11 being inserted in the communicating pore 65 of the connection section 63 of another reinforcement member 11, and being engaged.

[0038] Moreover, in the connection means shown in drawing 15, the connection sections 66 and 67 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. Communicating pore is formed in these connection sections 66 and 67, respectively. And another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the connection section 66 of the reinforcement member 11 and the connection section 67 of another reinforcement member 11 piling up up and down, and a bolt 68 being inserted in over the communicating pore of both [ these ] the connection sections 66 and 67, and being bound tight with a nut 69. In addition, it can change to a bolt 68 and a nut 69, a connection clip can be inserted over the communicating pore of both the connection sections 66 and 67, and another reinforcement member 11 can also be connected with the edge of the reinforcement member 11.

[0039] Moreover, in the connection means shown in drawing 16, the connection sections 70 and 71 protrude on the external surface of the horizontal wall 12 of the both ends of the reinforcement member 11, respectively. And another reinforcement member 11 is connected with the edge of the reinforcement member 11 by the connection section 70 of the reinforcement member 11 and the connection section 71 of another reinforcement member 11 piling up up and down, and both [ these ] the connection sections 70 and 71 being carried out adhesion 72 by adhesives, a binder, etc.

[0040] In the gestalten 1-3 of said operation, although it constituted so that the hollow room 6 might be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation might be aimed at by the foam 35 by heating foaming of the fizz base material 30, it is not necessary to necessarily intercept the hollow room 6. For example, by arranging the fizz base material 30 to the crowning 14 and pars basilaris ossis occipitalis 15 of the reinforcement member 11, and combining the inner circle wall side and the reinforcement member 11 of the hollow room 6 of the hollow panel 1 in the shape of one by the foam 35 by heating foaming of the fizz base material 30, it can fix firmly to the inside of the hollow room 6, without vibrating the reinforcement member 11, and effectiveness is large to reinforcement of the hollow panel 1.

[0041] (Gestalt 4 of operation) The gestalt 4 of implementation of this invention is explained according to drawing 17 - drawing 28. In the gestalt 4 of this operation, the reinforcement member 111 consists of hard synthetic resin which has thermal resistance like the gestalt 1 of operation or the gestalt 2 of operation, and abbreviation, and a hard synthetic-resin ingredient with which the fiber for strengthening was mixed desirably, and is really fabricated by injection molding. This reinforcement member 111 equips one with two or more wall sections 113 prolonged in the longitudinal direction of the hollow room 6 of the hollow panel 1, and two or more horizontal walls 112 which connect the wall section 113 of these plurality.

[0042] As shown in drawing 17 - drawing 19, while outside wall section 113a which adjoins 2nd inside wall section 113b from the left toward predetermined, for example, drawing 18, on the outside becomes large and the bottom counters in the shape of [ of abbreviation reverse Ha ] a character, the bottom is narrowly combined by the pars basilaris ossis occipitalis 115 among two or more wall sections 113 of said reinforcement member 111. While the bottom is narrow and 2nd inside [ the right to ] wall section 113b is combined by the crowning 114 toward drawing 18 toward 2nd inside wall section 113b and drawing which adjoins the inside from the left, the bottom became large and has countered in the shape of [ of abbreviation Ha ] a character. Furthermore, while outside wall section 113a which adjoins 2nd inside wall section 113b from the right toward drawing 18 on the outside becomes large and the bottom counters in the shape of [ of abbreviation reverse Ha ] a character, the bottom is narrowly combined by the pars basilaris ossis occipitalis 115. And the space section 116 which the space section 117 which the bottom becomes large toward drawing 18 in the part surrounded by the wall section 113 of plurality [ wall / 112 / of said plurality / side ], carry out opening, and the bottom is narrow, and was taken up with the pars basilaris ossis occipitalis 115, and the bottom are narrow, and it is closed by the crowning 114, and the bottom becomes large, and carries out opening adjoins in the direction of the short hand of the hollow room 6 by turns, and partition formation is carried out. That is, the reinforcement member 111 of the gestalt 4 of this operation has at least four wall sections 113, and is making the shape of the cross section of about W characters. in addition, the opposite include angle of the adjoining wall section



113 -- the range of five - 60 degrees -- in the range of ten - 30 degrees, it is set up preferably.

[0043] As the gestalt 4 of this operation is especially shown in drawing 17 - drawing 19, the both ends of the longitudinal direction of both outside wall section 113a located in both sides among the wall sections 113 of the plurality (four) of the reinforcement member 111 are really combined by the outside terminal wall 120 in the shape of continuation. And both [ these ] outside wall section 113a and the outside peripheral wall section 122 which makes annular by both the outside terminal wall 120 are constituted. Moreover, the both ends of the longitudinal direction of both inside wall section 113b which adjoins inside both outside wall section 113a of the reinforcement member 111 are really combined by the inside terminal wall 121 in the shape of continuation. And both [ these ] inside wall section 113b and the inside peripheral wall section 123 which makes annular by both the inside terminal wall 121 are constituted.

[0044] Moreover, as shown in drawing 20 and drawing 21, while the bottom becomes large and the outside terminal wall 120 and the inside terminal wall 121 counter in the shape of [ of abbreviation reverse Ha ] a character toward drawing, the bottom is narrowly combined by pars-basilaris-ossis-occipitalis 115a. And space section 117a of the part concerned makes annular mostly with the space section 117 of said both sides, and the pars-basilaris-ossis-occipitalis 115a concerned is opening it for free passage while making the same side mostly with the pars basilaris ossis occipitalis 115 of said both sides and continuing. That is, between the outside peripheral wall section 122 and the inside peripheral wall section 123, the space section which makes annular mostly by the space sections 117 and 117a is constituted. Moreover, ranging over between outside wall section 113a which constitutes the outside peripheral wall section 122 as shown in drawing 18, and outside horizontal wall 112a which constitutes the inside peripheral wall section 123, two or more outside horizontal wall 112a is prepared in one, and it is \*\*\*\*\*. Furthermore, as shown in drawing 19, ranging over between both inside wall section 113b which constitutes the inside peripheral wall section 123, two or more inside horizontal wall 112b is

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prepared in one. And in the gestalt 4 of this operation, said outside horizontal wall 112a or inside horizontal wall 112b constitutes the horizontal wall 112. Moreover, the thick dimension of the horizontal wall 112 (outside horizontal wall 112a and inside horizontal wall 112b) is suitably set up small rather than the thick dimension of the wall section 113 (outside wall section 113a and inside wall section 113b), and reduction of an ingredient (synthetic-resin ingredient) is achieved.

[0045] Moreover, in the gestalt 4 of this operation, as shown in drawing 19 and drawing 23, the attachment clip 150 as an attachment means to be inserted in the mounting hole 7 of the inner panel 2, and to engage with the inferior surface of tongue of pars-basilaris-ossis-occipitalis 115a located in the both-ends approach of the reinforcement member 111 elastically is really fabricated. This attachment clip 150 was constituted almost like the gestalt 1 of operation, and equips one with the seat 151, the leg 152, and the piece 153 of a stop of a pair. Moreover, the reinforcement member 111 is equipped with the fizz base materials 130-135 which combine the inner circle wall side and the reinforcement member 111 of the hollow panel 1 by foaming by heat tracing and becoming foam.

[0046] In the gestalt 4 of this operation, in order to equip with the fizz base materials 130 and 131 to the reinforcement member 111, as shown in drawing 18 and drawing 19, crevices 124 and 125 are formed [ near the height direction both ends (vertical both ends) of the outside peripheral wall section 122 (outside wall section 113a and outside terminal wall 120) of the reinforcement member 111 ], respectively. Among said both crevices 124 and 125, the crevice 124 of the upper limit section of the outside peripheral wall section 122 is cut in the top face of the flange jutted out over the upper limit section periphery of the outside peripheral wall section 122 by making annular mostly, and is making annular mostly along with the flange. Moreover, as shown in drawing 18 and drawing 19, the crevice 125 of the lower limit section of the outside peripheral wall section 122 is cut in the inferior surface of tongue of partes basilaris ossis occipitalis 115 and 115a, and is making annular mostly along with partes basilaris ossis occipitalis 115 and 115a. However, the crevice 125 has broken off in the part to the seat 151 of the attachment clip 150. Furthermore, the crevice 126 for holding the fizz base material 132 along with the longitudinal direction of the crowning 114 is cut also to the top face of the crowning 114 of the inside peripheral wall section 123.



[0047] Moreover, the reinforcement member 111 is equipped with the fizz base materials 133, 134, and 135 of the required number for collaborating with said each fizz base material 130, and intercepting the hollow room 6 while combining the inner circle wall side and the reinforcement member 111 of the hollow panel 1. In the gestalt 4 of this operation, in order to equip with said fizz base materials 133 and 134 While outside horizontal wall 112a which makes a pair, respectively, and inside horizontal wall 112b separate narrow spacing and are arranged in the both-ends approach of the longitudinal direction of the reinforcement member 111 The piece 160 of maintenance of the pair which makes the same side mostly with said outside horizontal wall 112a and inside horizontal wall 112b, and projects is formed in the lateral surface of outside wall section 113a. And between these pairs each of an outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance, the fizz base material 136 is inserted, respectively and it is equipped with it.

[0048] As for said fizz base materials 130 and 136, it is desirable to be formed from the fizz ingredient which uses as a principal component the synthetic resin which has an adhesive property to a metal side or a synthetic-resin side like the fizz base material 30 of the gestalt 1 of operation, fibrous material for strengthening like a foaming agent and a glass fiber etc. is mixed by this, foams with the heat at the time of be the baking finish of the car body ( for example, temperature around 110 degrees C - 190 degrees C), and serves as foam of high rigidity. As a fizz ingredient which has such an adhesive property and serves as foam of high rigidity, it is indicated by JP,8-208871,A, JP,11-158313,A, etc., for example.

[0049] Moreover, the fizz base material 130 with which the crevices 124 and 125 near the height direction both ends of the outside peripheral wall section 122 of the reinforcement member 111 which make annular mostly, and the crevice 126 of the crowning 114 of the inside peripheral wall section 123 are equipped, respectively is easily formed, when what was formed in the shape of a long rod of extrusion molding is cut by predetermined die length. And the unit or two or more fizz base materials 130 of die length which are made necessary are pushed in to each crevices 124, 125, and 126, and it is equipped by pasting up with adhesives if needed. Moreover, it is bent and equipped with the fizz base material 130 to the corner section of crevices 124 and 125 which is making annular mostly.

[0050] Moreover, by injection molding, the fizz base materials 133, 134, and 135 with which it is equipped between a pair each outside horizontal wall 112a of the both-ends approach of the longitudinal direction of the reinforcement member 111, inside horizontal wall 112b, and the piece 160 of maintenance are formed in plate-like [ of the configuration made necessary ], and it is inserted and equipped with them between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance. And between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance, adhesives are used and the fizz base materials 133, 134, and 135 paste up so that each fizz base materials 133, 134, and 135 may not be omitted between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance. Moreover, it may change to adhesives, the stop sections, such as a stop projection, may be prepared between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance, and each fizz base materials 133, 134, and 135 may be stopped.

[0051] said reinforcement implement 110 equipped with the reinforcement member 111 and the fizz base materials 130 and 136 as carried out should pass the almost same process as the gestalt 1 of operation -- it is equipped in the hollow room 6 of the hollow panel 1 (refer to drawing 20 - drawing 23 ). And as shown in drawing 24 , the reinforcement member 111 and the inner circle wall side of the hollow panel 1 are combined because each fizz base materials 130-135 foam, respectively and serve as foam 138 by heat tracing. By this, while reinforcing the hollow panel 1, the hollow room 6 is intercepted. Moreover, it is like the gestalt 1 of said operation, and abbreviation, and also in the gestalt 4 of this operation, while the synthetic-resin ingredient for fabricating the reinforcement member 111 is reducible with the space sections 116 and 117, it will become lightweight, and since that opening side makes the shape of a large taper, each space sections 116 and 117 can unmold the reinforcement member 111 easily from a die.

[0052] The outside peripheral wall section 122 in which it is really combined by the outside terminal wall 120 in the shape of continuation, and the both ends of the longitudinal direction of both outsides

wall section 113a located in both sides among two or more wall sections 113 of the reinforcement member 111 make annular by it in the gestalt 4 of this operation especially is constituted. For this reason, it becomes the structure which cannot deform the reinforcement member 111 easily, and reinforcement reinforcement is raised by the outside peripheral wall section 122 which makes annular. Furthermore, the inside peripheral wall section 123 in which it is really combined by the inside terminal wall 121 in the shape of continuation, and the both ends of the longitudinal direction of both inside wall section 113b which adjoins inside both outsides wall section 113a of the reinforcement member 111 make annular by it is constituted. And the end of the outside peripheral wall section 122 and the inside peripheral wall section 123 is combined with one by partes basilaris ossis occipitalis 115 and 115a, and the other end of the inside peripheral wall section 123 is combined with one by the crowning 114. For this reason, the reinforcement member 111 serves as structure which cannot deform much more easily, and reinforcement reinforcement is further raised to fitness.

[0053] Furthermore, [ near the both ends of the height direction of the outside peripheral wall section 122 ], the fizz base materials 130 and 131 of the crevices 124 and 125 which make annular mostly along a perimeter in the outside peripheral wall section 122 foam, respectively, serve as foam 138, and can combine the perimeter of the both ends of the height direction of the outside peripheral wall section 122 of the reinforcement member 111, and the inner circle wall side of the hollow panel 1. Furthermore, the fizz base material 130 of the crevice 125 of the crowning 114 of the inside peripheral wall section 123 foams, it becomes foam 138, and the crowning 114 of the reinforcement member 111 and the inner circle wall side of the hollow panel 1 can be combined. For this reason, in the reinforcement member 111, it can respond to the load which acts on the hollow panel 1 through each foam 138, and effectiveness is large to reinforcement of the hollow panel 1. Moreover, in the both-ends approach of the longitudinal direction of the reinforcement member 111, the fizz base materials 133, 134, and 135 with which it was equipped, respectively between a pair each outside horizontal wall 112a, inside horizontal wall 112b, and the piece 160 of maintenance can foam, respectively, can serve as foam 138, can combine the reinforcement member 111 and the wall peripheral surface of the hollow panel 1, and can intercept the hollow room 6. For this reason, while being able to heighten the reinforcement effectiveness further, the hollow room 6 can be intercepted and improvement in the vibration-deadening nature of the hollow panel 1 or insulation can be aimed at.

[0054] In the gestalt 4 of said operation, in case each fizz base materials 130-135 foam, respectively, according to the field where each crevices 124, 125, and 126 face, and the field where outside horizontal wall 112a of a pair, inside horizontal wall 112b, and the piece 160 of maintenance face, it is regulated that each fizz base materials 130-135 foam to the longitudinal direction of the hollow room 6, and it foams towards the inner circle wall side of the hollow panel 1. For this reason, the foam 138 by foaming of each fizz base materials 130-135 pastes up that there is no clearance in the inner circle wall side of the hollow panel 1. Consequently, the fault (for example, poor noise insulation) by generating of a clearance can be prevented.

[0055] In addition, in the gestalt 4 of said operation, as shown in drawing 25 and drawing 26, you may change. That is, as shown in drawing 25, the tabular fizz base materials 136 and 137 are stuck by adhesives to the lateral surface of the outside peripheral wall section 122 of the reinforcement member 111. And the inner circle wall side and the reinforcement member 111 of the hollow room 6 of the hollow panel 1 are combined in the shape of one by the foam 136a and 137a by foaming of these fizz base materials 136 and 137. Therefore, by combining the inner circle wall side and the reinforcement member 111 of the hollow room 6 of the hollow panel 1 in the shape of one by the foam 136a and 137a by foaming of the fizz base materials 136 and 137, without vibrating the reinforcement member 111, it can join together to the inside of the hollow room 6, and effectiveness is large to reinforcement of the hollow panel 1. Moreover, it is also possible to constitute the reinforcement member 111 stated with the gestalt 4 of said operation possible [ connection to the longitudinal direction of the hollow room of a hollow panel ] with the connection means stated with the gestalt 3 of operation.

[0056] Moreover, when it crosses in the shape of T character to the upper part of the hollow panel 1 which constitutes a center pillar and the roof side panel (it is also called a roof side rail) is continuing as



it is indicated in drawing 28 as drawing 27 for example, it is also possible to form at one the extension prolonged in the hollow room of a roof side panel in the upper part of the reinforcement member 111 which interior is carried out to the hollow panel 1, and reinforces it, and to reinforce a T character-like intersection. In this case, as shown in drawing 28, the extension of the right and left mostly prolonged in the shape of level towards the hollow room of a roof side panel is formed in the upper outside terminal wall 120, respectively among both the outsides terminal walls 120 that have combined the both ends of the longitudinal direction of both outsides wall section 113a of the reinforcement member 111. Furthermore, both the extensions of the right and left mostly prolonged in the shape of level along with the inside of both the extensions of said outside terminal wall 120 are formed in the upper inside terminal wall 121, respectively among both the inside terminal walls 121 that have combined the both ends of the longitudinal direction of both inside wall section 113b of the reinforcement member 111. Thus, in the upper limit section of the reinforcement member 111, the intersection of the shape of T character of a center pillar and a roof side panel can be reinforced by forming an extension in upper outside terminal wall 120a and upper inside terminal wall 121a, respectively.

[0057] In addition, this invention is not limited to the gestalten 1-4 of said operation. For example, although the case where the reinforcement implement 10 (or 110) was constituted by the combination of the reinforcement member 11 (or 111) and the fizz base material 30 (or 130-137) was illustrated in the gestalten 1-4 of said operation It is not necessary to surely use the fizz base material 30 (or 130-137), and it may constitute the reinforcement implement 10 (or 110) only by the reinforcement member 11 (or 111). Moreover, it may change to the attachment clip 50 (or 150) as an attachment means for equipping with the reinforcement member 11 (or 111) to the hollow panel 1, a bolt, a nut, etc. can also be used, and the attachment clip of another object may be further used in the reinforcement member 11 (or 111). Moreover, although the case where the hollow structures were the hollow panels 1, such as a pillar of the car body, a rocker panel, and a roof panel, was illustrated, the hollow structure may be the hollow structure which constitutes buildings, such as a building except the car body, and a vessel.

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[Translation done.]



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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the condition of having separated the reinforcement member and fizz base material of a gestalt 1 of a reinforcement implement. [ of implementation of this invention ] [ of the hollow structure ]

[Drawing 2] It is drawing of longitudinal section based on the II-II line of drawing 1 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 3] It is a cross-section side based on the III-III line of drawing 2 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 4] It is a cross-section side based on the IV-IV line of drawing 2 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 5] It is the cross-sectional view showing the condition of the fizz base material of a reinforcement implement having foamed similarly, and having become foam.

[Drawing 6] Two or more same horizontal walls of a reinforcement member are the explanatory views showing the embodiment arranged in the state of slant to the longitudinal direction of a hollow room.

[Drawing 7] Two or more same horizontal walls are the explanatory views showing the embodiment connected by the one wall section.

[Drawing 8] It is the perspective view showing the condition of having separated the reinforcement member and fizz base material of a gestalt 2 of a reinforcement implement. [ of implementation of this invention ] [ of the hollow structure ]

[Drawing 9] It is drawing of longitudinal section based on the IX-IX line of drawing 8 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 10] It is a cross-section side based on X-X-ray of drawing 9 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 11] It is a cross-section side based on the XI-XI line of drawing 9 which shows the condition of similarly having equipped the hollow room of a hollow panel with the reinforcement implement.

[Drawing 12] It is the cross-sectional view showing the condition of the fizz base material of a reinforcement implement having foamed similarly, and having become foam.

[Drawing 13] It is the explanatory view showing the condition that the reinforcement implement of the hollow structure of the gestalt 3 of implementation of this invention was shown, and the reinforcement member of a required number was connected with the longitudinal direction by the connection means.

[Drawing 14] Similarly the connection means of a reinforcement member is the explanatory view showing the embodiment constituted with the piece of a stop, and the stop hole.

[Drawing 15] Similarly the connection means of a reinforcement member is the explanatory view showing the embodiment constituted with the bolt and the nut.

[Drawing 16] Similarly the connection means of a reinforcement member is the explanatory view showing the embodiment constituted by the means for detachable of adhesives etc.

[Drawing 17] It is the perspective view separating and showing the reinforcement member and fizz base material which constitute the reinforcement implement of the hollow structure of the gestalt 4 of implementation of this invention.

[Drawing 18] It is the perspective view showing a part of reinforcement member from the upper part similarly.

[Drawing 19] It is the perspective view showing a part of reinforcement member from a lower part similarly.

[Drawing 20] It is drawing of longitudinal section based on XX line of drawing 18 which shows the condition of having equipped with the reinforcement implement which similarly makes a reinforcement member a subject to the hollow room of a hollow panel.

[Drawing 21] It is drawing of longitudinal section based on the XXI line of drawing 18 which shows the condition of having equipped with the reinforcement implement which similarly makes a reinforcement member a subject to the hollow room of a hollow panel.

[Drawing 22] It is a cross-sectional view based on the XXII-XXII line of drawing 18 which shows the condition of having equipped with the reinforcement implement which similarly makes a reinforcement member a subject to the hollow room of a hollow panel.

[Drawing 23] It is a cross-sectional view based on the XXIII-XXIII line of drawing 18 which shows the condition of having equipped with the reinforcement implement which similarly makes a reinforcement member a subject to the hollow room of a hollow panel.

[Drawing 24] While a fizz base material foams, becoming foam and combining a reinforcement member to the hollow room of a hollow panel by heat tracing similarly, it is the cross-sectional view showing the condition of having intercepted the hollow room.

[Drawing 25] It is the cross-sectional view showing the embodiment which stuck and arranged the fizz base material in the location similarly made necessary [ of a reinforcement member ].

[Drawing 26] While a fizz base material foams, becoming foam and combining a reinforcement member to the hollow room of a hollow panel by heat tracing similarly, it is the cross-sectional view showing the condition of having intercepted the hollow room.

[Drawing 27] It is the explanatory view in which showing the gestalt of operation of \*\* of this invention, and showing the condition that the reinforcement member was arranged by the intersection of the shape of T character with a roof side panel with a center pillar.

[Drawing 28] It is the perspective view showing the reinforcement member of the configuration corresponding to a T character-like intersection similarly.

[Drawing 29] It is the perspective view showing the reinforcement implement of the conventional hollow structure.

[Description of Notations]

1 Hollow Panel (Hollow Structure)

6 Hollow Room

10,100 Reinforcement implement

11,111 Reinforcement member

12,112 Horizontal wall

13,113 Wall section

14,114 Crowning

15,115 Pars basilaris ossis occipitalis

16 17,116,117 Space section

30,130-135 Fizz base material

35,138 Foam

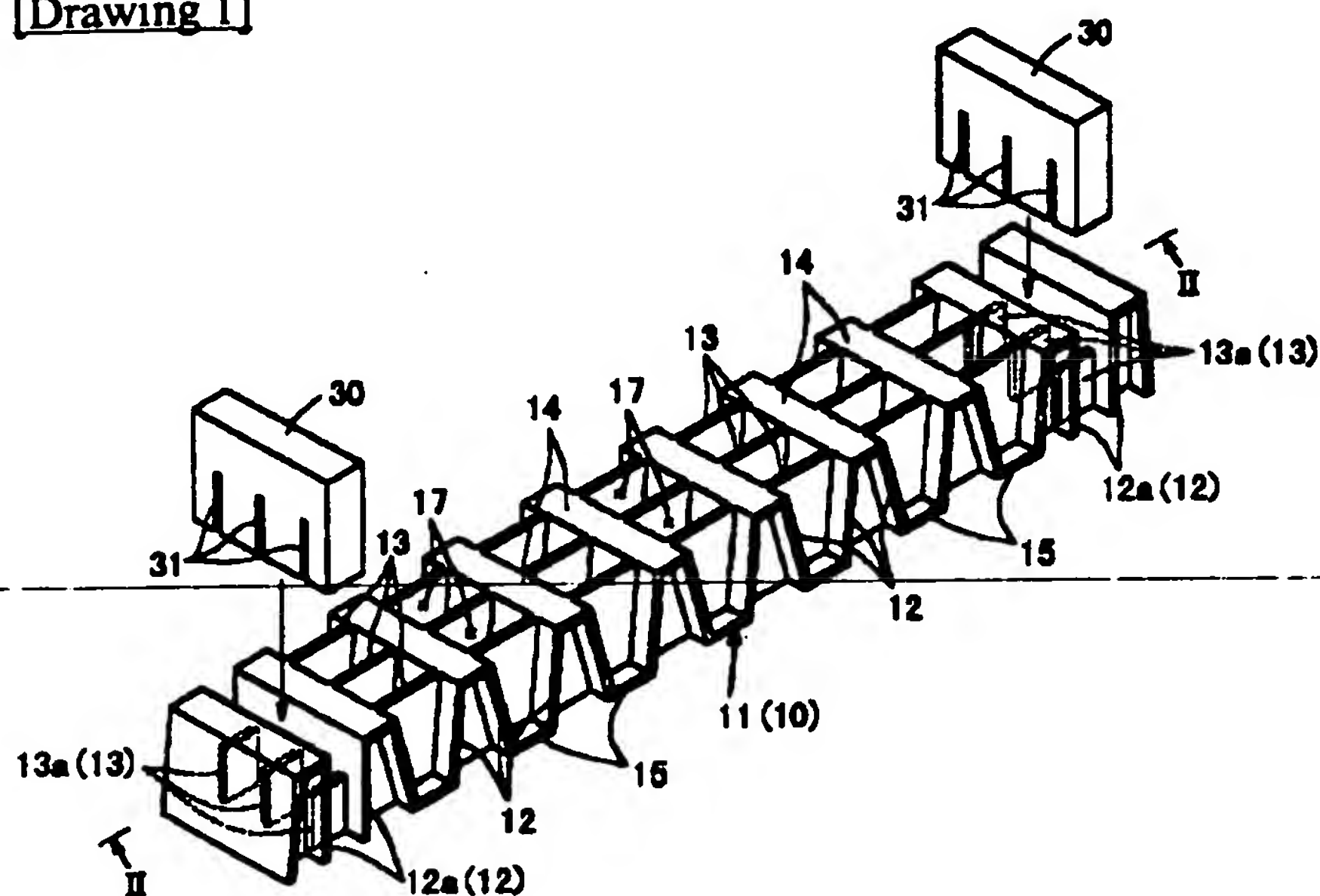
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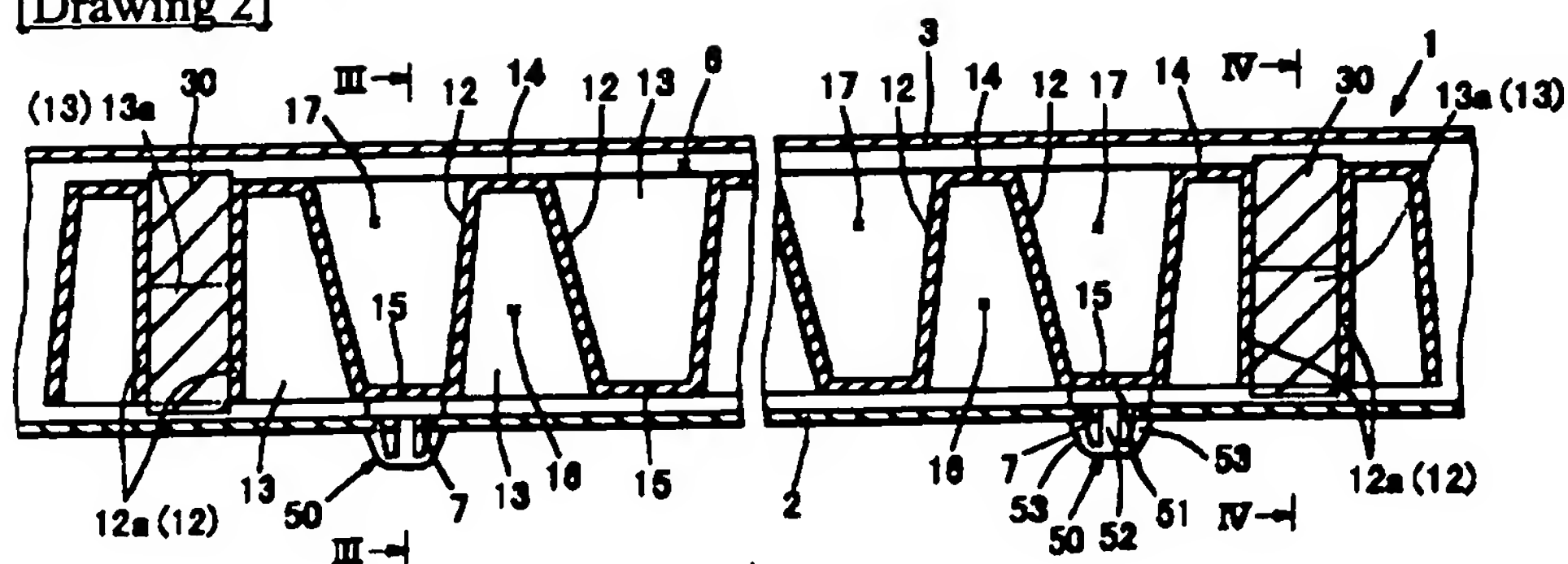
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## DRAWINGS

[Drawing 1]

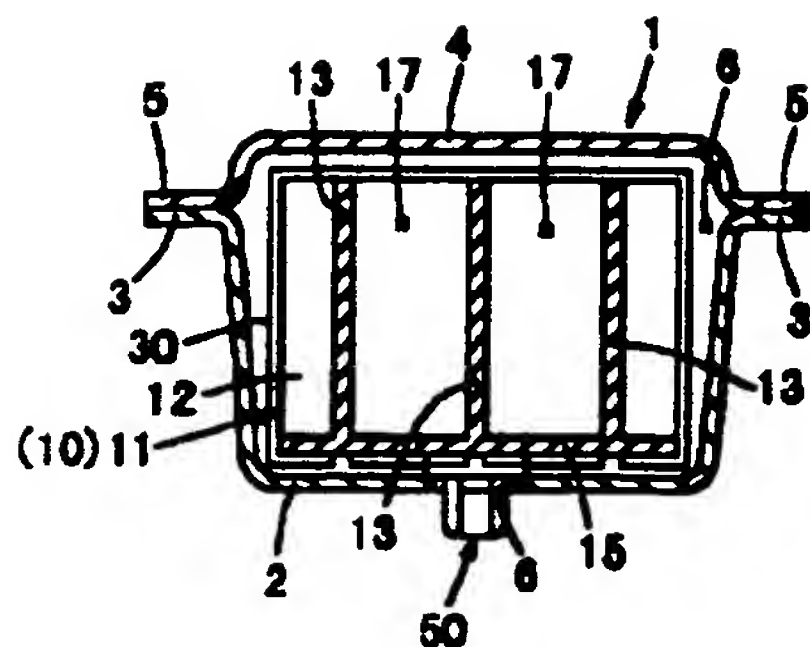


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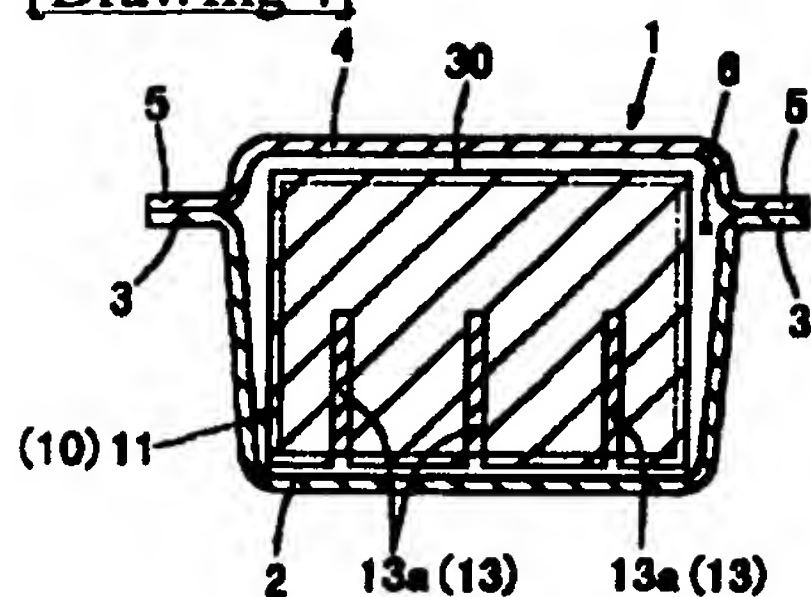


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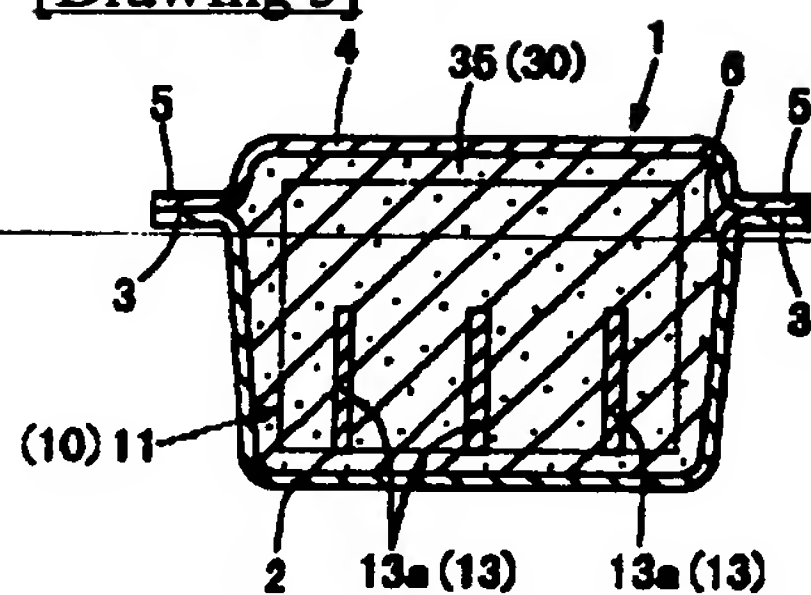




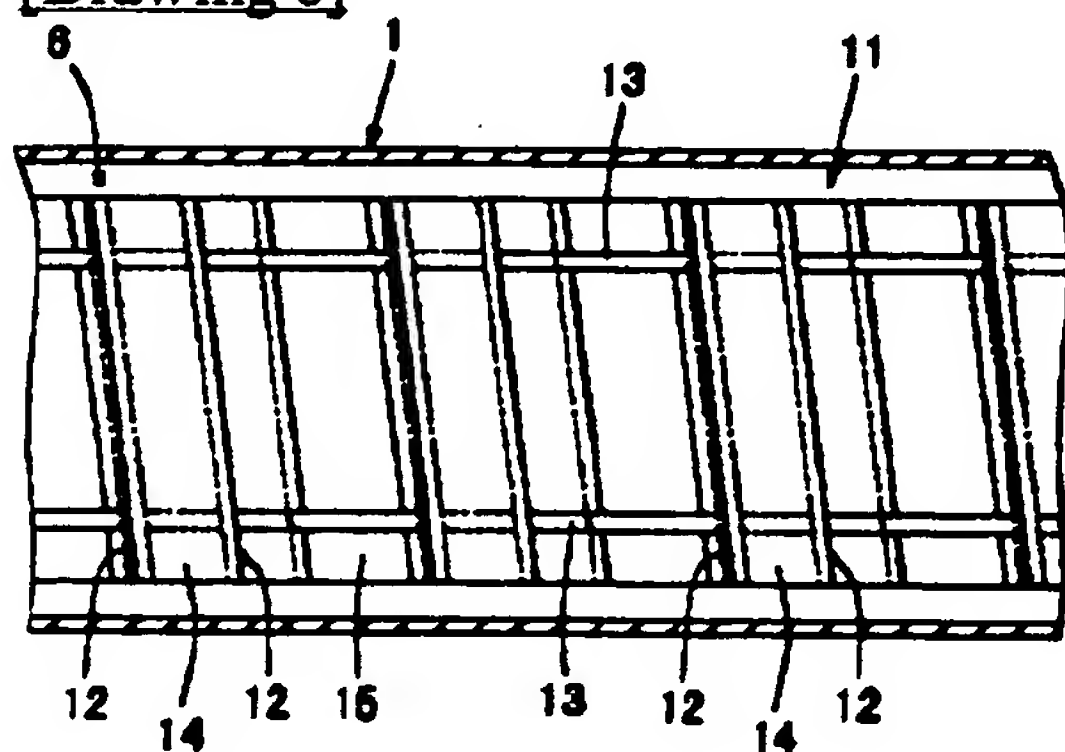
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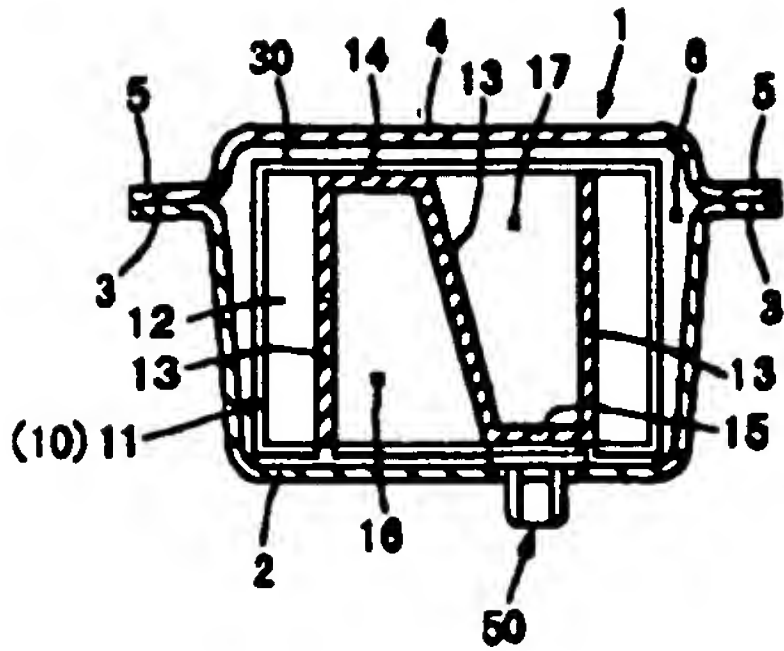
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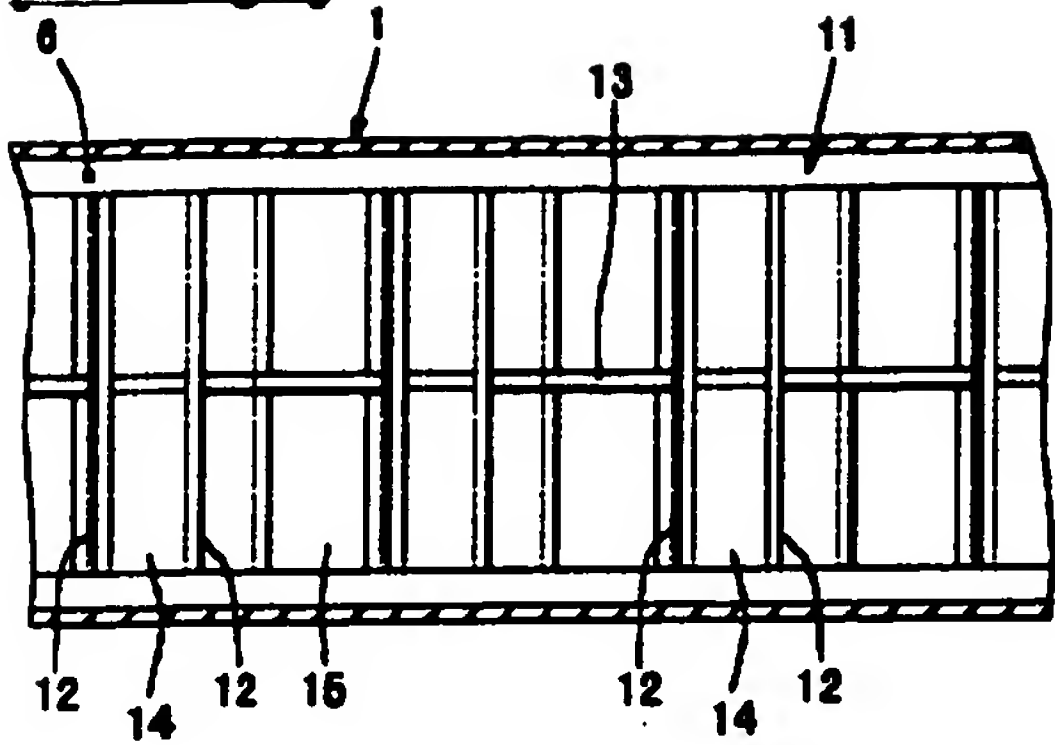
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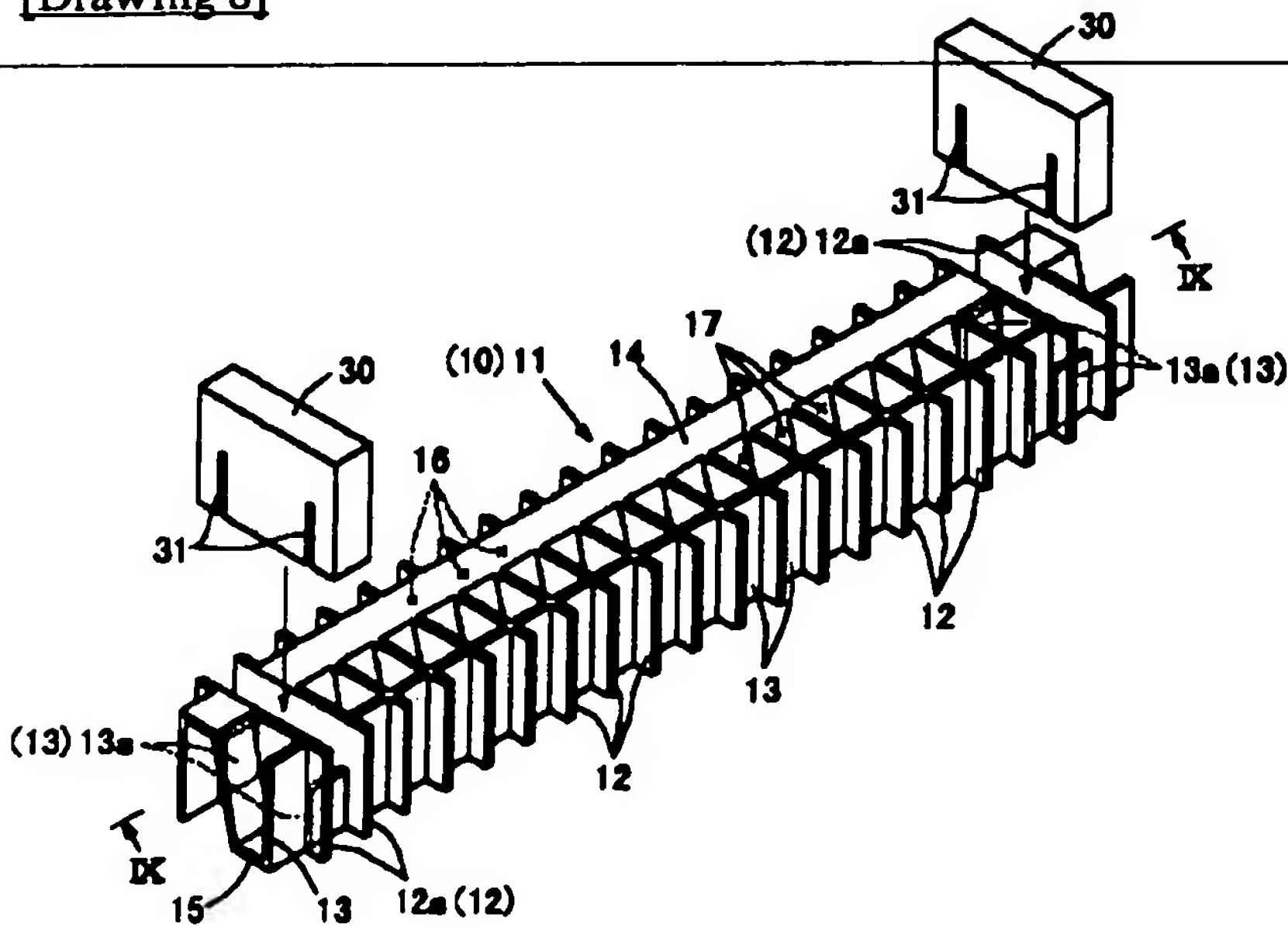
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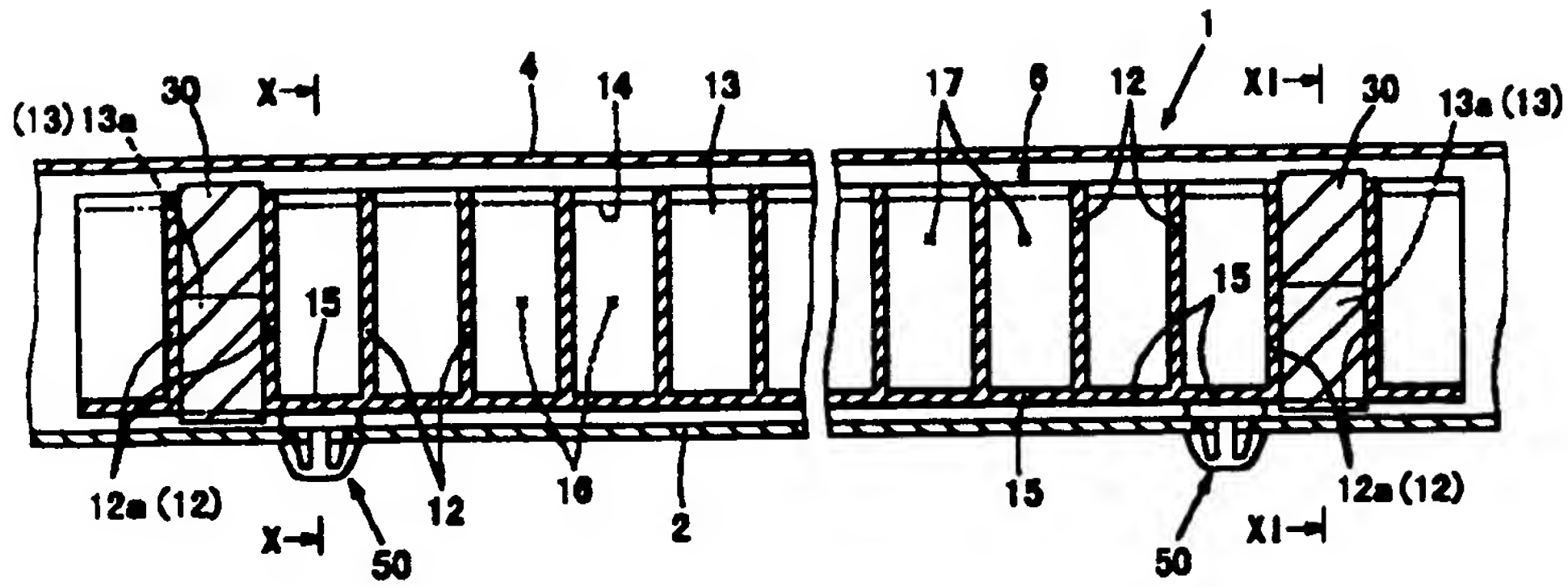
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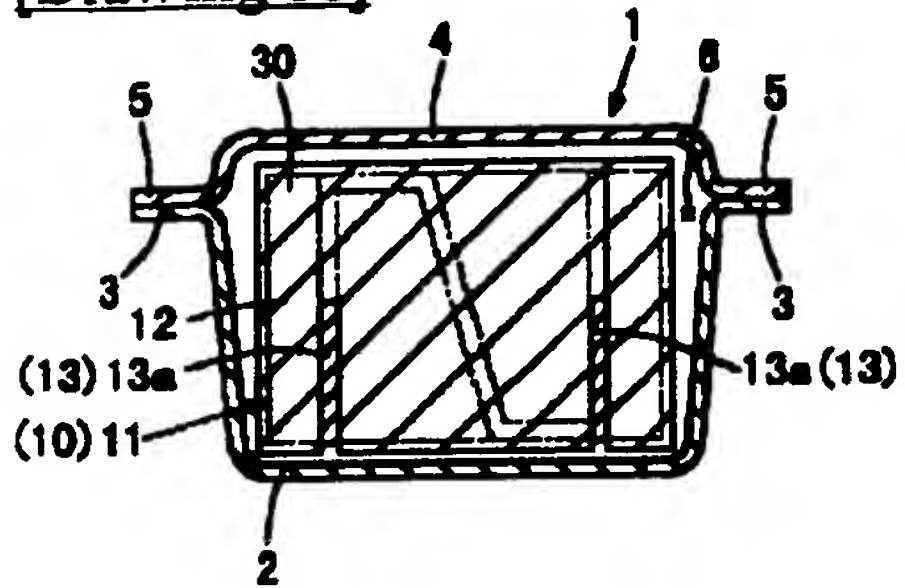
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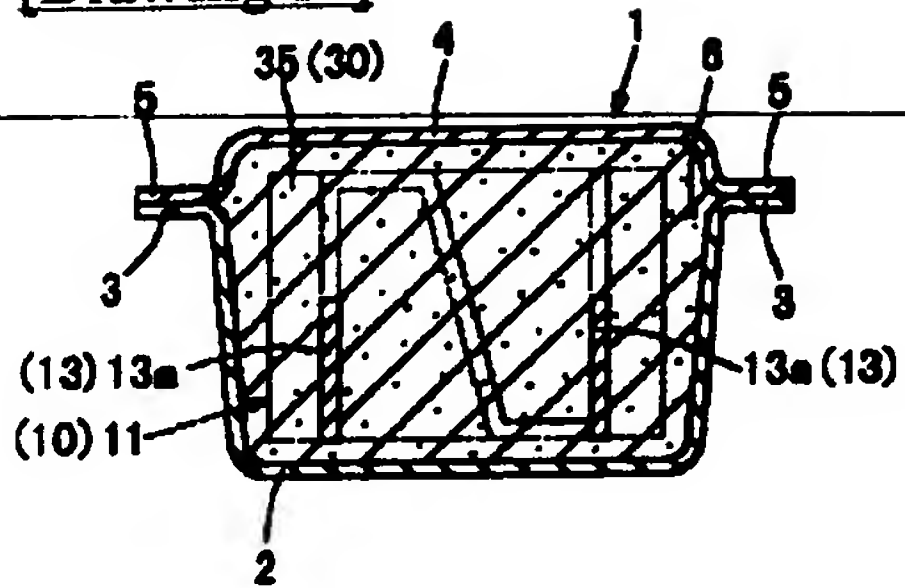
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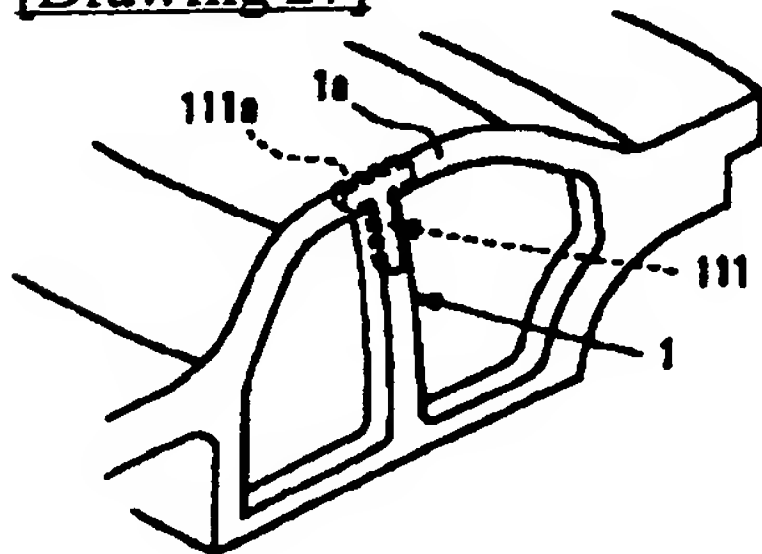
[Drawing 11]



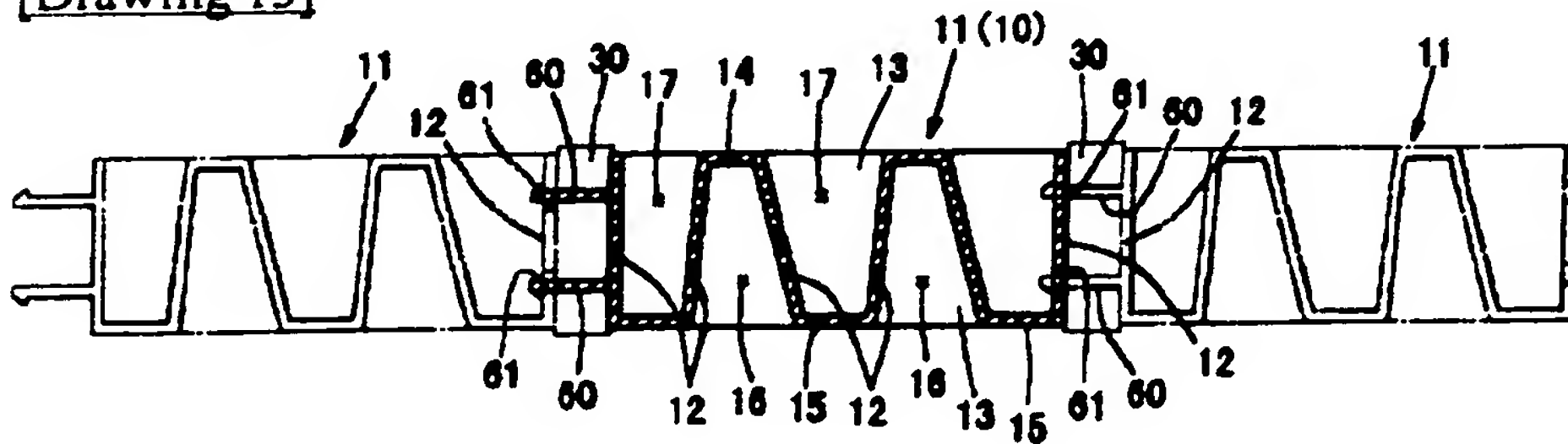
[Drawing 12]



[Drawing 27]

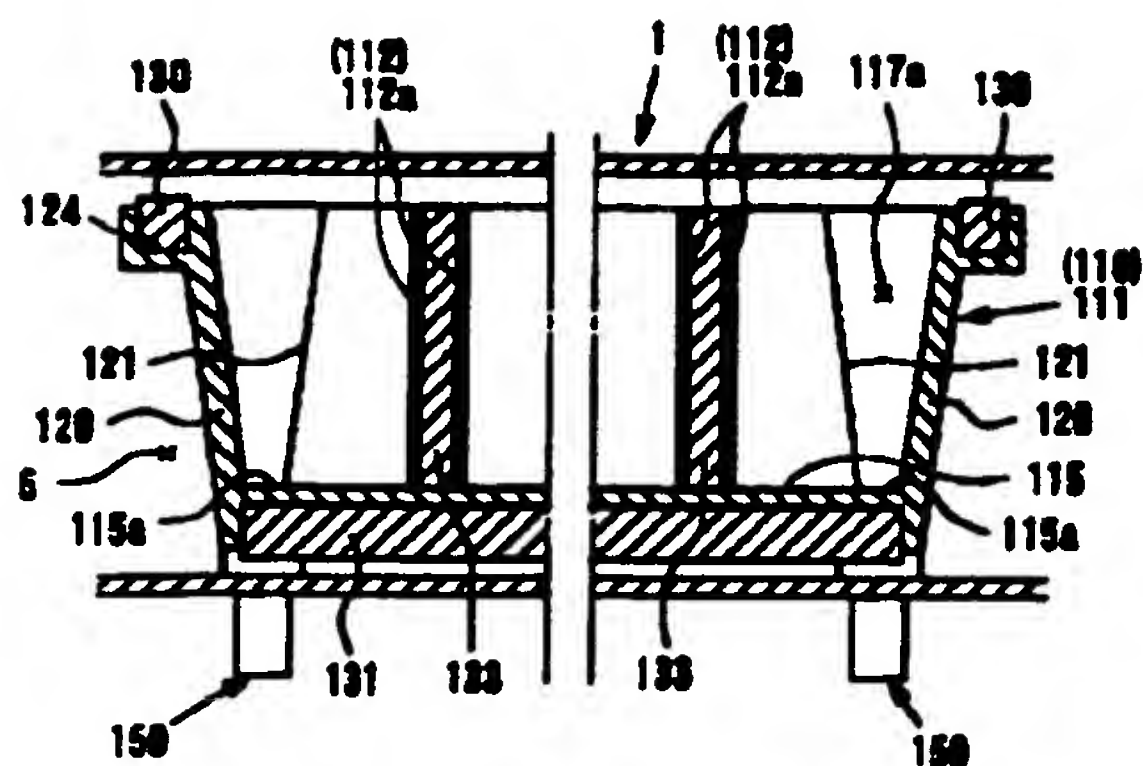


[Drawing 13]

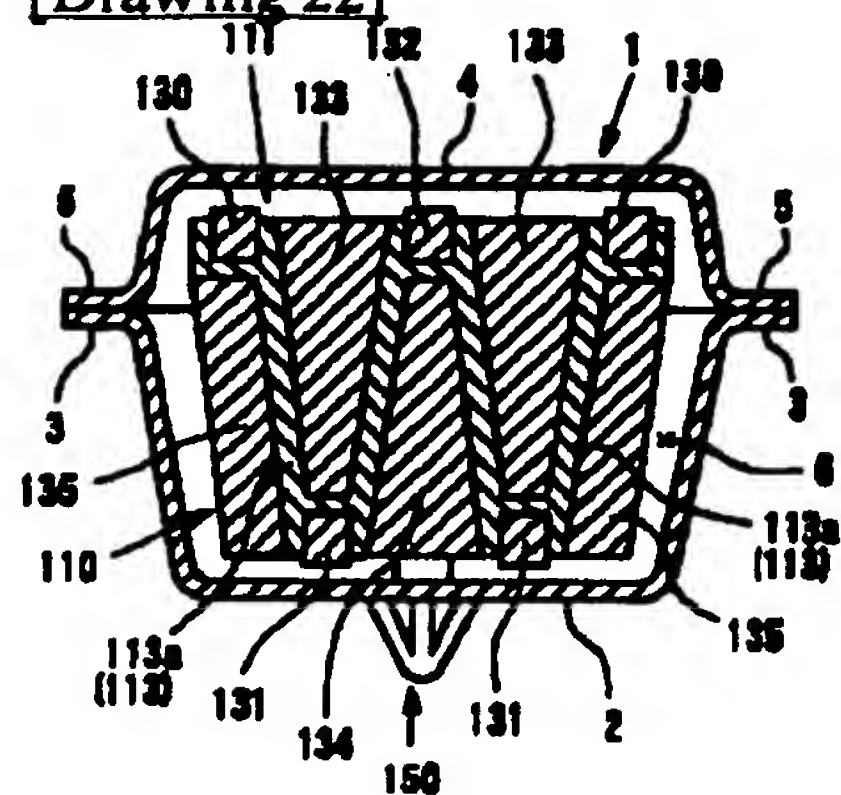




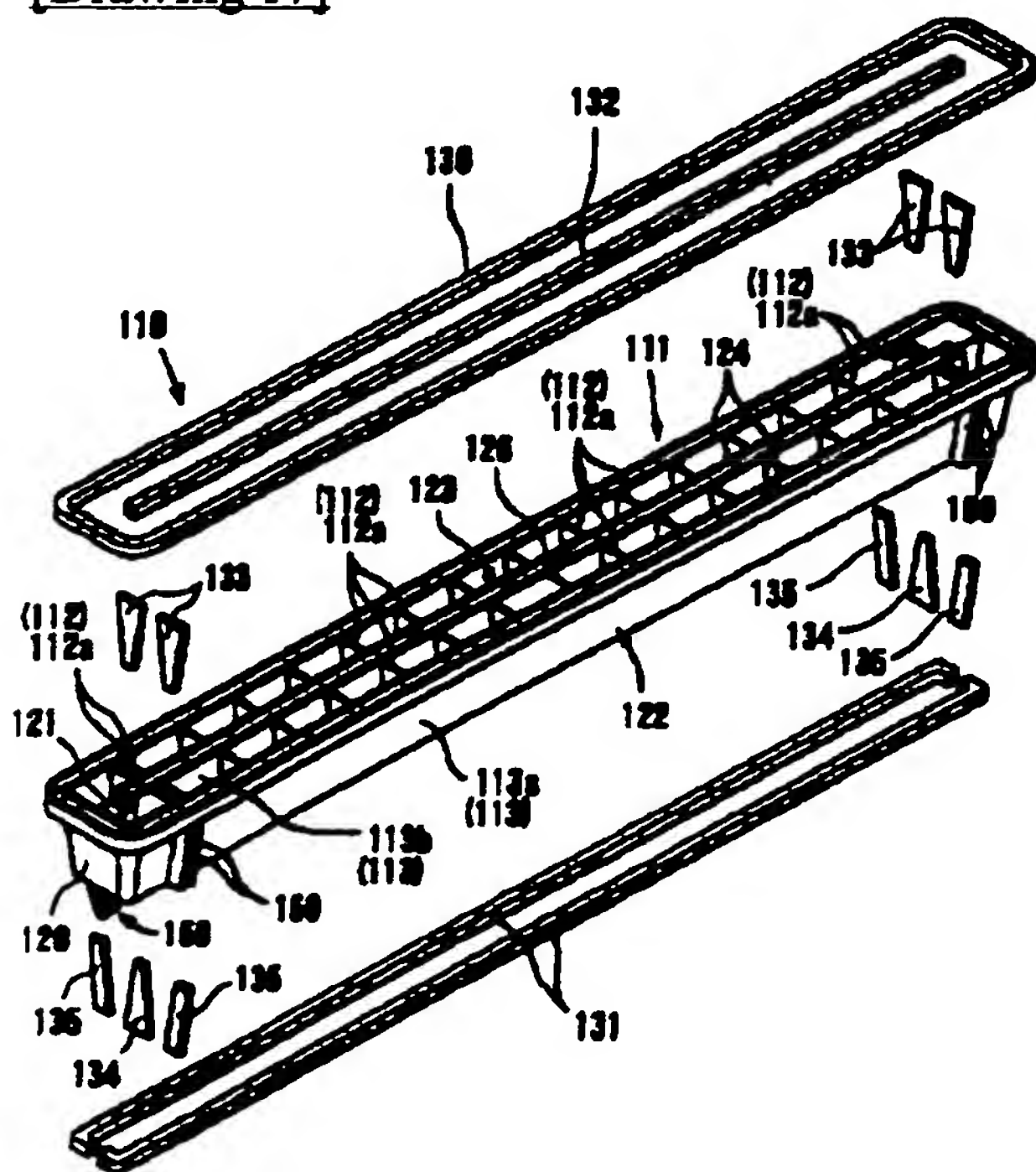




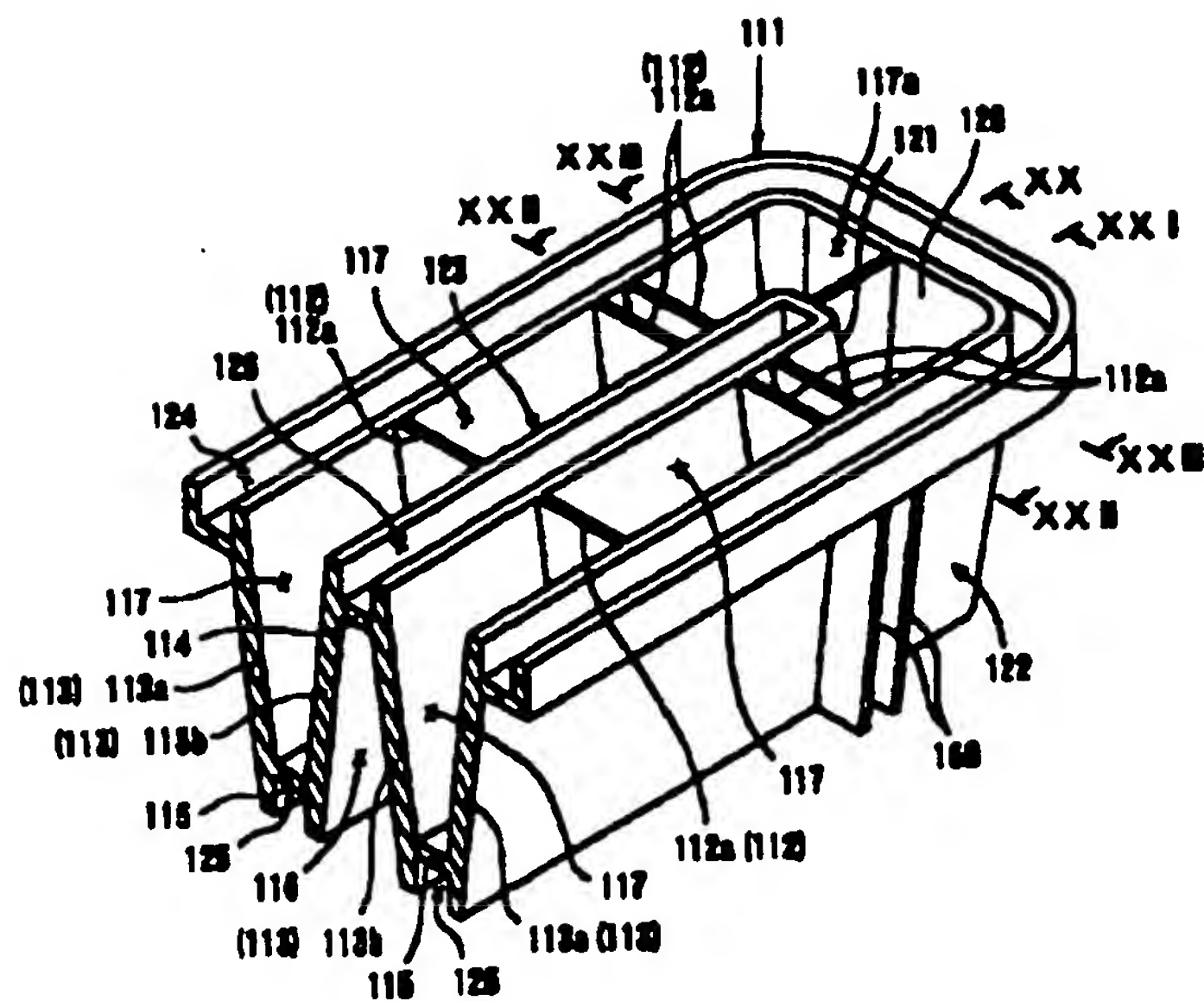
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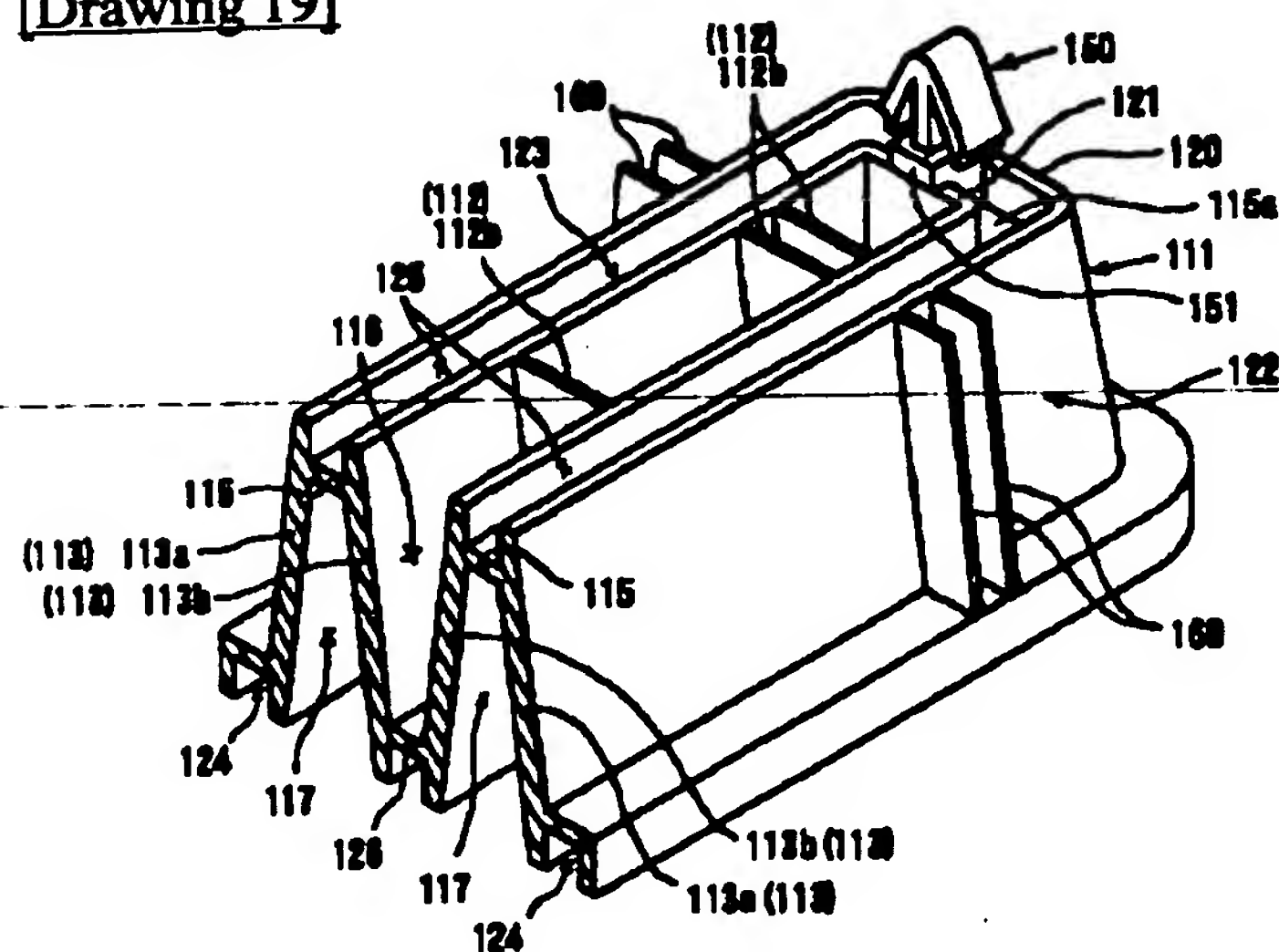
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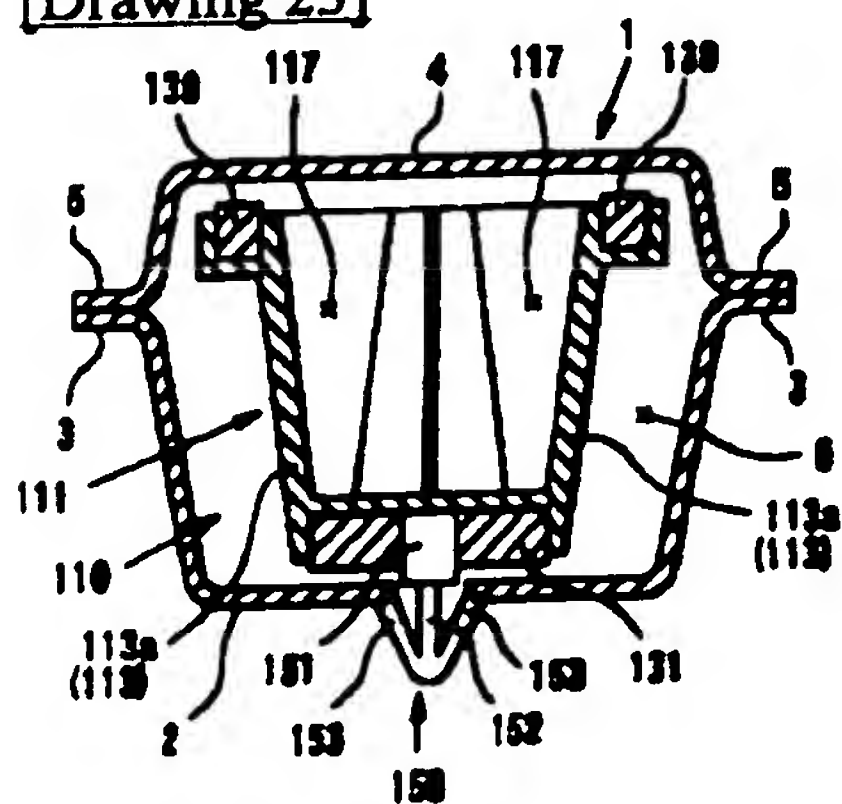
[Drawing 18]



[Drawing 19]

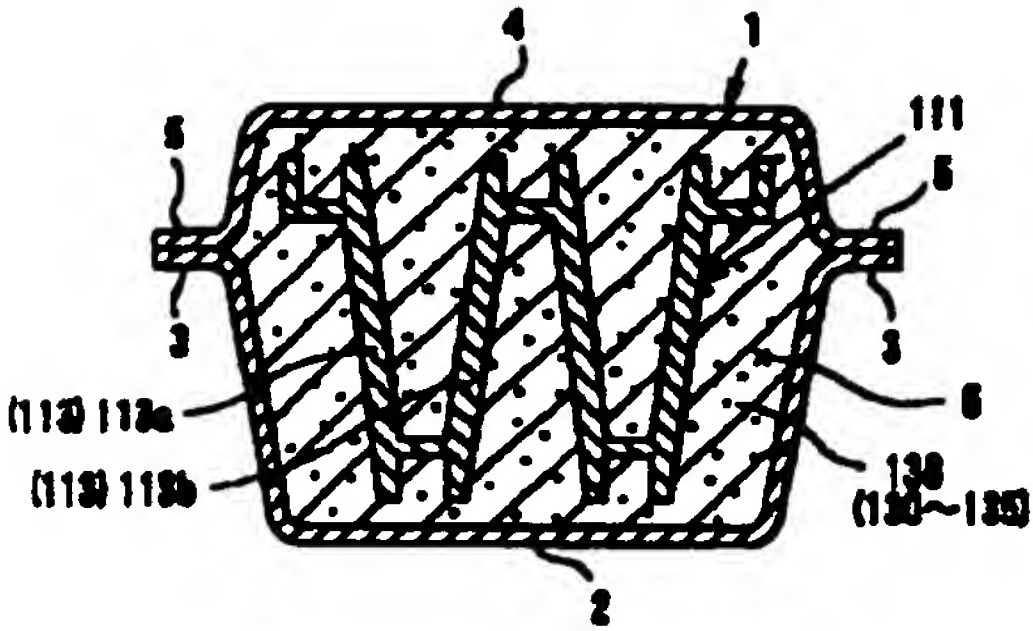


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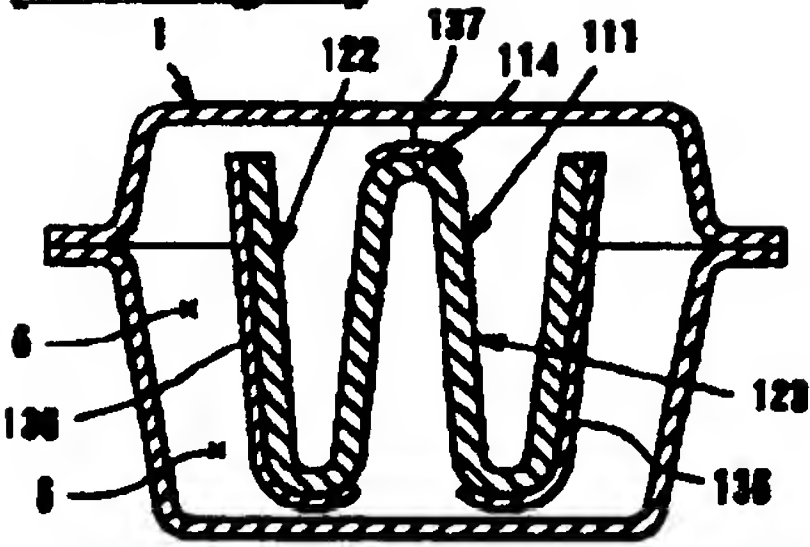


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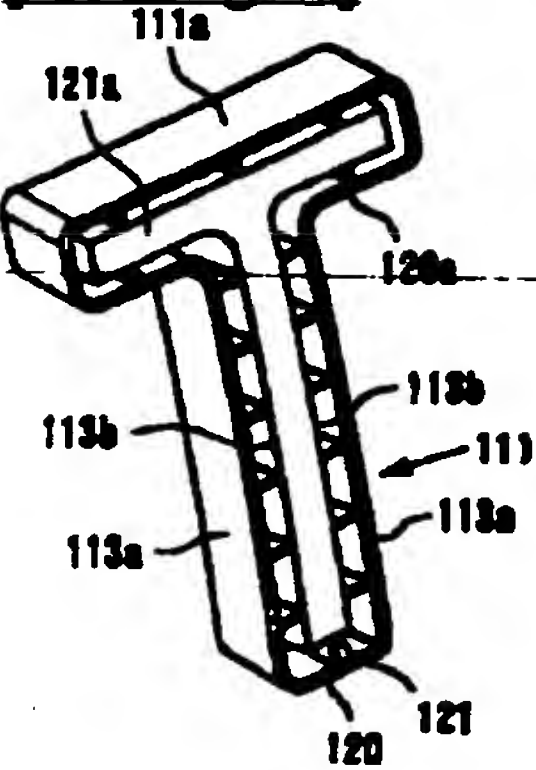




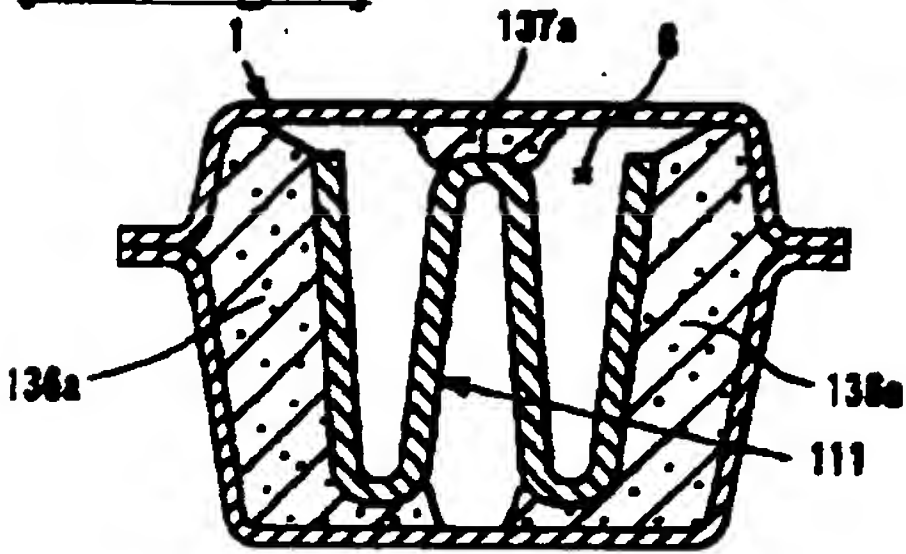
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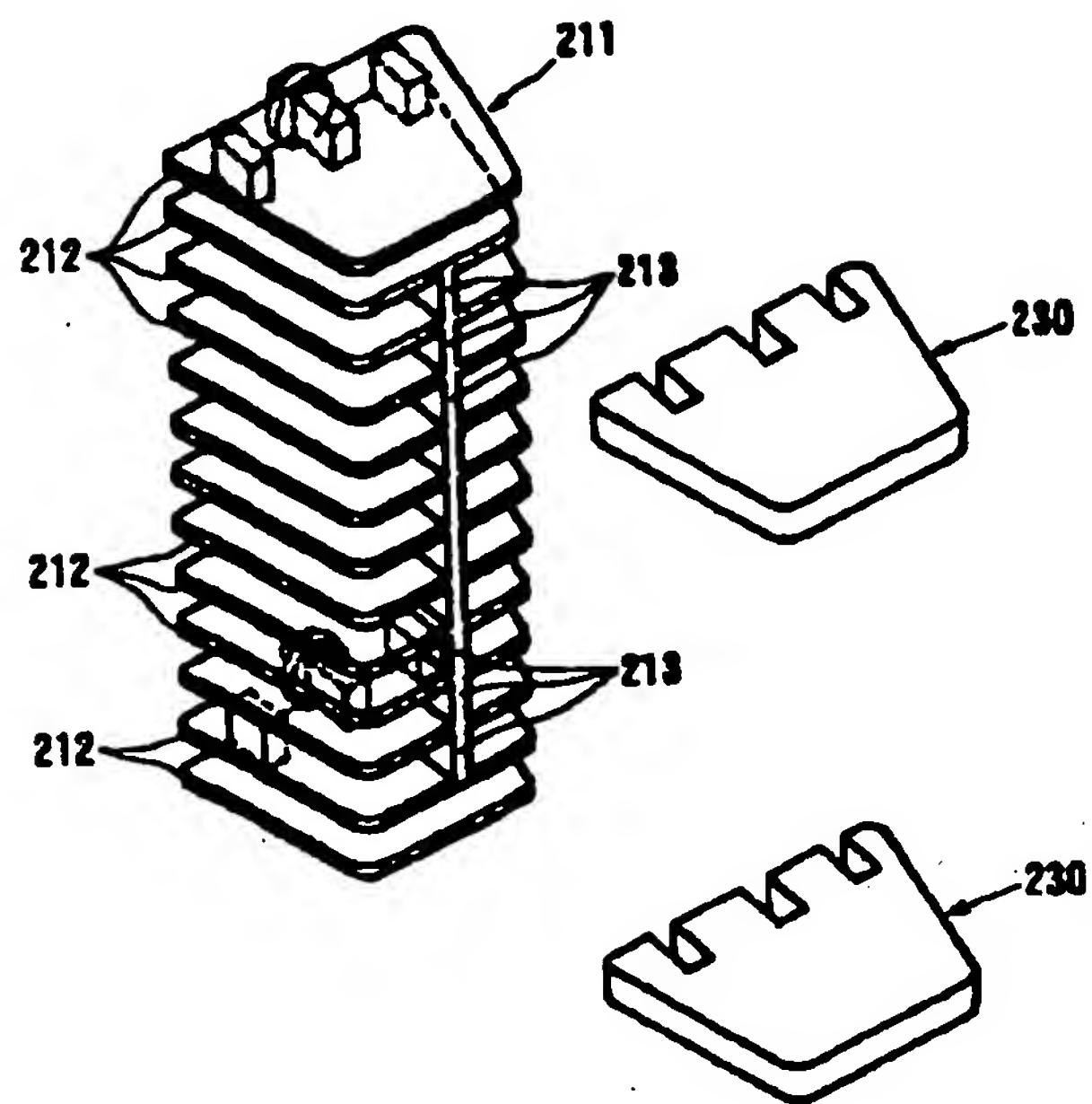
[Drawing 28]



[Drawing 26]



[Drawing 29]



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